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THE CHEMIST;

OR,

REPORTER OF CHEMICAL DISCOVERIES AND IMPROVEMENTS,

AND

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EDITED BY

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LECTURER ON CHEMISTRY,

AND

JOHN WATT, JUN.

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INTRODUCTION.

We have now fulfilled our engagements with the public for the past year; and a year in the science of Chemistry at the present time is an epoch, in comparison with the like period previous to the discoveries of Black, Cavendish, Priestley, Lavoisier, Davy, Watt. None who are acquainted with the works of those illustrious men can fail to trace to their labours that total revolution, from vague hypothesis and chimerical conjecture, to sound theory and accurately defined laws which now supply their place in that science, the most extended in its range of objects, and the most important in its application to the arts of man. Nothing surely can be wanting to shew the value of their services to mankind but the mere record of their researches in Light, Heat, and Electro-Chemistry; the discoveries of Hydrogen, Oxygen, and Nitrogen as simple bodies, as the elements of water and the atmosphere, and as affording satisfactory explanations of the phenomena of respiration and combustion; of the composition of the Alkalies and Earths, and the development of the character of Chlorine; the researches on Nitrous Oxide, and the invention and perfection of the safety lamp by the transcendent power of that chief of Chemists who has left behind him so many proofs "to give the world assurance of a man;" the construction and varied application of the steam-engine by the immortal Watt, needs from us no comment—it is sufficient to conclude in the words of Black, that it is "the noblest gift of philosophy to the arts."

Since the time of these men, whose "works are their best monument," what rapid progress has it not made; nay, indeed, we may add, what daily progress is it not making! Let us only refer to the beautiful applications of the Daguerréotype to the fine arts, by which in a few minutes correct likenesses can be taken with the perfection of nature, instead of the mawkish flatteries and crudities of art. Not less valuable, though perhaps less astounding, is the process of Electrotype, by one application of which is superseded one of the most destructive and dangerous manufacturing operations of any employed in the arts. The use of mercury in the processes of gilding and silvering is for ever exploded by the simple aid of solution and electric action.

In the once hopeless and gloomy paths of organic chemistry, the discoveries are now equally important and valuable. The labours of Chevreul, Fremy, Boudet, Poutet, Couerbe, and particularly Liebig, manifest the highest adaptation for research, and the most unexampled success in its application: by the works of the latter this branch of the science may with truth be said to have reached an equal degree of advancement with the chemistry of inorganic matter, and presents the highest prospects of far greater extension. The present period seems one in which discoveries are of such frequent occurrence, that one of an ordinary nature produces but little effect or surprise: it now requires something totally unexpected, and even beyond ordinary conception, to produce any excitement among men of science: such a period, then, is, of all others, that in which to prosecute the study of Chemistry, and to encourage diligent application and thorough knowledge of its facts and doctrines, in those who are about to engage in its pursuits; and firmly are we convinced that such study will prove as beneficial to themselves as to society.

In the section devoted to Chemistry, we have published valuable communications from scientific contributors, amongst whom we may mention as deserving of our thanks, Mr. Hiley, of Elland. We have also given translations of the most laborious, interesting, and important labours of our continental brethren, whose additions to our knowledge during the present year have been very numerous. To mention all, or even many of them in this place, would be unnecessary, if practicable. Still there are some which must not pass unnoticed: such as M. Biot's "Memoirs on Atomic Chemistry;" "Investigations concerning the Composition of the Brain of Man," by M. Fremy; the "Investigations concerning the True Atomic Weight of Carbon," by MM. Dumas and Stass (made in 1840) are, perhaps of greater importance than any other articles in this volume. M. Peligot has furnished the scientific world with the results of some very elaborate "Investigations concerning Ulmic Acid and Uranium," which he has proved to be not a metal, but a metallic oxide, from which he obtained metallic uranium. M. Jacquelain has also given us some valuable information concerning the "Elementary Composition of Certain Species of Anthracite." M. Boussingault's paper, "On the Composition of the Air which is found in the Pores of Snow," and his "Researches," in conjunction with M. Dumas, "as to the True Composition of the Atmosphere," are most valuable contributions to Chemical Science. There are also most important papers, by M. Larocque

" On Gallic Acid;"—by MM. Boutron-Charlard and E. Fremy, " On Lactic Fermentation;"—by M. Peligot, " On the Atomic Weight of Uranium;"—by M. Capitaine, " On the Atomic Weight of Iron;"—and by M. Thierry, " On Guaiacic Acid, and on Extract of Guaiacum;" with many others, for the excellence of which the following names, which form but an inconsiderable part of those which grace our work will be a sufficient guarantee: — Bunsen, Gregory, Buchner, Ettling, Hare, Playfair, Johnston, Vogel, Gerhardt and Cahours, R. F. Marchand, Thomson, Kuhlmann, Von Kobell, Laurent, Langlois, Persoz, Liebig, H. Rose, A. Rose, Mitscherlich, Gay-Lussac, Pelouze, Daniell, Brown (Dr.), Girault, Pelletier, Lassaigne, Wöhler, Bromeis, Tilley, Deville, &c. &c. &c.

In the section of Chemical Manufactures less has been published; but still the articles will be found of great utility and of the highest importance; we do not see any necessity for recapitulating them here.

" Pharmacy" has been chiefly devoted to the all-engrossing topic of Medical Reform. The formation of a Pharmaceutical Society is, perhaps, one of the greatest events of the year: * but the Council invested with the management of the affairs of the Society has rendered it perfectly unavailing to provincial druggists, nor does it appear to us to be much more beneficial to metropolitan ones. This Society, on its first formation, had our support, which we soon found ourselves obliged to withdraw. In this section, many communications from correspondents on the subject of medical reform are given. This department also contains much of a scientific character that will prove useful to the pharmacopolist.

The pages of The Chemist forming, as they do, an organ of communication of all the improvements in the science, and its application to the arts and manufactures, as well as of all that is new in Pharmacy, bring before the Chemist a record, enabling him to keep pace with the progress of these important subjects; and we have too extended sources of knowledge of the high opinion of the manner in which the performance of our duties is estimated by the profession and the public, as well as from the circulation of the work, not to be satisfied that such a medium as The Chemist is, of all the others, best adapted to assist the student, and to forward the views of the adept.

Although during the present year there have not been made, either in this country or on the continent, any discoveries of great importance, still,

* The Pharmaceutical Society is a sad, but apt, illustration of the saying—" Parturiunt montes, nascetur ridiculus mus."

have we had to record many valuable additions to our knowledge, and to our resources of industry in the arts and manufactures. The cultivation of chemistry by those who are engaged in dispensing Medicine, as well as a more extended knowledge of Pharmacy will, we are as confident as we shall be rejoiced at its existence, be compelled by an act of the Legislature, made to re-organize the profession of Medicine, and to remedy the sad catalogue of abuses, which have so long prevailed, and are so congenial to certain classes of its members. That this profession must be reformed, is too evident; but the question is, how? To enable apothecaries to take fees, as well as keep chemists shops? To prevent chemists from dispensing to the poor a simple remedy! To perpetuate the infamous power of excluding from professional right and rank all except such as are educated by themselves, or rather, we should say, such as have paid them for education? To these questions our reply is, No;—but by a thorough reform in the system of education, examination, and by throwing open the means of obtaining qualification to all, wherever taught, so long as they are proved worthy of the trust. That an efficient act, therefore, for the regulation of the whole profession will next Session pass the Legislature, we are confident; and in every stage of its progress we shall devote our utmost attention and vigilance to guard the profession against any unfair encroachments of its different ranks upon each other, and the public from the perpetuation of ignorance, cupidity, and disgraceful practices.

Among other improvements which we hope soon to see made in the medical profession is the compulsion to obtain a far greater amount of chemical knowledge than is now done. It is easy to show its general importance to medical science, and this is by no means confined to pharmaceutical chemistry. We contend that it is of infinitely greater importance than has generally been allowed by physicians, in relation to physiology and pathology. The chemical composition of the different parts of the body, and the actions by which they are affected and maintained, are, indeed, subjects of the highest importance to the medical practitioner, for on these must depend their functions, and any changes in their frame must reciprocally produce corresponding ones in the latter. We are astonished that its relation to pathology should not long since have been made apparent to them. Many subjects of the most grave inquiry present themselves to our notice, which we cannot but view with the greatest interest, as vitally connected with morbid action. In the first place, is it not of the highest consequence to endeavour to trace the influence in the composition of the various parts in health and disease?

We have found the brain, the muscular &c. structure, the liver, spleen, and the various secretions, the blood &c., totally changed in their chemical composition from that of their healthy state. Surely these subjects are well worthy the study of the physiologist and the physician, and much more likely to benefit the learners than the ravings of homœopathy.

In the past year of our exertions in supplying matter worthy the attention of our readers, we have kept in view our original engagements; viz., to present them with all that is new in Chemistry, Chemical Manufactures, and Pharmaey, and have likewise exerted our best—and we have good reason to congratulate our readers and ourselves that they have been successful—efforts in protecting the rights and privileges of Chemists and Druggists from the encroachments of the Apothecaries, the machinations of the Medical Association, and the trade from total destruction by hasty and ill-devised measures brought before the House of Commons, and so handsomely withdrawn by Mr. Hawes, when he found a certain clause bear unexpectedly heavy upon them. We fear, nay, we are certain, that their interests will not be in better hands in the next Session, and we must arouse their attention in time.

That our matter during the year has been of the most interesting and instructive kind can admit of no doubt; we have detailed researches and discoveries not found in any of the more elaborate works of chemistry, since published by men of the highest eminence, both in this country and on the Continent.

In Manufactures we have detailed all that was new and worth recording, including original papers of great interest and importance, as tending to simplify processes, to improve our commerce, and to increase our sources of industry and employment.

In Pharmacy we have added much that is of importance, and more especially have we used every exertion to expose and prevent the disgraceful practice of adulteration of drugs, so extensively praetised among the lower grades of the Chemists and Druggists, and those who follow the disreputable practice of marking their spurious articles with tickets of their prices, which are low only in proportion to their adulteration.

In all the sections of this Journal, and in conformity with our engagements with our readers, we have fully kept in view the objects of the work, and we have received the most ample encouragement from the public, and the highest testimonials of approbation from the press in all parts of the United Kingdom and elsewhere.

In conclusion, we shall continue our earnest recommendations to our readers, and particularly to all who are engaged in medicine, to obtain a perfect knowledge of chemistry, as being of the highest importance to their professional eminence and reputation, which we can safely predict will rise in exact proportion to their acquirements of its various facts and laws. No science is so universal in its extent: it is concerned in all the minute changes taking place in all the forms of matter; there is no atom, however small, which is not subject to chemical action, and there is no combination which is not the result of affinity, and no simple body which cannot be combined, nor compound which cannot be resolved into its simple elements. Surely, then, that science which teaches the nature, causes and changes which take place so universally and constantly between the particles of matter in its states, either of inorganic or organic existence, must, of all studies, be the most interesting and important to promote its cultivation and diffusion.

Our best exertions will ever be made during the next year: no pains will be spared to procure such subjects as are most valuable to our readers, who, we trust, will view the aequisition of knowledge, like that of riches, as begetting a desire for it in exact proportion to the possession of it: none need fear to obtain the knowledge of any science if he desires it; and he who wishes it, will be certain to gain it by study and application, verifying the words of Isocrates,—"Εαν ῆς φιλομαθὴς, ἔσῃ πολυμαθὴς."

THE CHEMIST.

ADVERTISEMENT.

In commencing another year, we feel bound to make our best acknowledgments to our numerous subscribers for their encouragement of The Chemist, and likewise to our contemporaries, for the liberal and very handsome manner in which they have recognized our labours. Stimulated by such marks of public approbation—the best rewards of a journalist, because they are the most solid—and under the cheering auspices of the most extended patronage and extraordinary and increasing sale since its first appearance, we pledge ourselves to unceasing exertions to render the work still more worthy of their support, by supplying much original matter,—by having recourse to all the best foreign sources,—and by the most vigilant guardianship of the interests of our brethren. In short it will continue to rise in interest as it advances in favor and circulation, making it manifest that merit—

"Grows with their growth, and strengthens with their strength."

The Science of Chemistry is one of peculiar interest; none embraces so wide a range of objects;—involving, as it does, an acquaintance with the laws, properties, changes and combinations of the particles of matter, it is by far the most comprehensive of all the branches of human knowledge.

But Chemistry is not confined to the mere development of the laws which regulate the actions of particles, nor to the revelations of abstract scientific truth; it is, if we may so speak, the parent of the chief arts necessary to the very existence, and mainly contributive to the comforts and luxuries of civilized man.

Where would be the resources in the great art of Medicine, were it not for the productions which are founded in Chemistry? Take these from the Pharmacopœia, and this, now the first of all human studies, would at once become the feeblest of the arts of man.

In the great processes of bleaching, dyeing, calico-printing, tanning, brewing, distilling, glass and soap-making, mining, and the immense works for the production of the alkalies and acids,—such as at Stoke, Glasgow, and Newton, &c., — where can we find a single part of their varied operations which has not received all that is important towards perfection from this omnipotent science? Without its aid, these now exhaustless sources of wealth and industry would have been comparatively lost

to the world. Where would have been the resources of employment for the poor in the absence of the arts of pottery, china and glass making, whose wonderful productions, of articles of indispensable utility and matchless elegance are fabricated in a manner suited either to the cottage or the palace? Of these we may indeed say with Ovid—*Quæ prosunt omnibus artes.* What then must be the value of that science by whose aid these sources of industry are established, extended, and improved! But for the diffusion of Chemical knowledge where could the arts look for further advances? Any benefit would in such case be the result of casual occurrence, not of study and thought; whereas to the aid of this science they seldom look in vain. What has it not done, and does it not promise to effect for them? It has not merely improved those already in existence; it has created thousands of new sources of wealth and industry; and in the ratio of its cultivation and advance, will it still further open exhaustless stores to the millions yet unborn. To neglect the study of it, is not only to neglect the best interests of society, but to throw away the surest means of our own prosperity.

It is with much pleasure we have to acknowledge the increased attention to, and cultivation of Chemistry by those concerned in the Chemical manufacture; indeed, it is far better known by these parties (many of whom are its brightest ornaments), than by those who are employed in that department appertaining to Pharmacy, even though this is its highest object. A fact so lamentable—yet so undeniable—will, we trust, be made the subject of obligatory remedy by the expected improvements provided in Mr. Hawes's Medical Reform Bill, which we may fairly hope will be the means of raising our brethren to the first rank in this science, instead of servilely following in the rear, as at present.

It will be recollected by our readers, that our pages are not addressed merely to the speculative Chemist, but to all engaged in pursuits whose processes are founded in that science, as well as to those whose occupations lead them to the manufacture or employment of those medicines which Chemistry forms. Hence it is manifest that The Chemist is at once interesting to all; and if we may judge from its extensive circulation among Chemical Manufacturers and those engaged in the larger works of art, (from many of whom we have received most flattering testimonials of the benefit they have derived from it,) we fear not that it will find a due share of favor among Chemists and Druggists, and their pupils, in as much as it is the only Journal exclusively devoted to that science, to know which, on their part, is a duty,—to neglect which is a crime.

The pages of The Chemist will in future be rendered of greater value to the various classes of our readers, by containing a series of original papers, in each department, written expressly for the work.

I. CHEMISTRY.

MEMOIR ON ATOMIC CHEMISTRY.*

BY M. BIOT.

It being my purpose to comprehend, in the same work, the phenomenal laws of the molecular actions which many substances exercise on polarised light, and the applications which have been, and may be made of these laws, to the study of chemical phenomena, I have naturally investigated the intimate relations of these two orders of facts, and I have endeavoured to demonstrate them. For this purpose I am constrained to consider chemistry under two heads,—experimental and rational. The first head presents an immense collection of phenomena, mysteriously operated by actions at small distances, which are exerted between the invisible particles of bodies, and whose ponderal analysis always fixes with certainty one of the conditions of accomplishment; but a condition attached only to their final and complex result—not to their physical and primordial principle. It is in the reverse of these effects, measured for perceptible masses, to the molecular actions from which they are derived, that the difficulty of converting chemistry into a mechanical science consists; —a difficulty incomparably greater than in the case of planetary astronomy, where the small number of bodies perceptibly acting on each other; their almost spherical form; their dimensions so small, compared to their intervals, that they act almost as simple points; the immense predominance of one of them in every partial system; and, finally, the very simplicity of the law of action,—were so many circumstances which left this law almost unaltered, and, it may be said, apparent, in the visible and constantly observable orbit which every planet or satellite describes round the principal body of its system. On the contrary, in chemical phenomena, where the number of particles which simultaneously act on one another is immense, we are ignorant of their individual forms, their relative bulks, the proportions of their dimensions to their intervals, the laws and the nature of the forces which govern them,—finally, the modes of motion which result from them,—all these being concealed from our senses. But it is also this which gives the importance to this part of chemistry, which may be called rational rather than theoretical; which consists, first, in connecting among themselves all the results of ponderal analysis, in always expressing them by certain uniform numbers for each substance, and which I will call their *numerical equivalents*, in order that it may not be considered hypothetical; next, in expressing the association of these numbers, in every complex compound, by a literal notation, showing the ponderal proportions of its simple constituent principles; and, finally, in determining the value of these numbers, and in grouping them in the literal notation in the manner best adapted for representing the mode in which these principles are presumed to combine, as well as the analogies of this mode between the various products. Indeed, although the accomplishment of these two last conditions presents exceedingly indeterminate problems, the solutions of which must ever be empirical, nevertheless, besides its immediate utility in systematising the partial results, and arranging them into general facts, it has another, less evident and more distant, without doubt, but, perhaps, still more important, which is to be manifested among the complex results of simple relations—physical as well as numerical—of which geometricians will one day avail themselves, as indices for tracing by induction to the molecular forces from which they ought to result. These considerations have made me very careful to establish at first the experimental conditions in which chemical phenomena are seen to operate; next, to express, in the most general way, and independent of all hypothesis, the molecular relations which ponderal analysis gives the means of ascertaining, in the most simple cases, between the composing substances and the compounds produced; then to compare these results with the chemical equivalents, or atomic weights, and to see whether they have or have not the physically molecular signification generally attributed to them. It is this preliminary discussion of my work on optical properties that I wish to submit to the attention of chemists, as an attempt to apply to the highest objects of their science a new process of investigation, which seems to me particularly applicable to it.

The most general, and, at the same time, the most accurate idea we can form concerning the constitution of material bodies, according to all the experiments which render them perceptible to us, is to look upon them as compounds of particles individually imperceptible to our senses, however assisted, by reason of their minuteness, thus forming small distinct bodies, endowed, like larger ones, with universal attraction, proportional to the bulks and reciprocal to the

* Read to *The Royal Academy of Sciences, Paris*, October 19, 1840.

square of the distances, and perhaps also acting on one another by other more rapidly decreasing forces; but still kept out of contact, either by a repulsive power emanating from themselves, or by the interposition of imponderable material media, which prevent them from joining by resisting or repelling them. The individual essence and the proper qualities of these imperceptible particles, constitute the chemical nature of every body, which remains so long as they are not permanently modified, or decomposed into other molecular systems, endowed with different properties. For such mutations may be effected, or rather provoked, in many cases; not, indeed, by mechanical operations, which would be far too coarse to reach such small molecules, but by dynamic actions, arising from dissimilar particles, or by modifying the quantity or the condition of the imponderable principles, particularly electricity and caloric, attached to their material elements, or interposed between them. In order to include in one common definition all the possible diversity of their simple or complex constitution, I shall henceforth term them *the material constituting groups* of bodies, without previously determining whether the imponderable principles which always accompany them are simply interposed, or whether they necessarily form part of them. And I shall conclude characterizing them by considering them as the last degree of subdivision that any body can undergo without being chemically altered in its nature.

Material bodies, considered in masses of sensible dimensions, should, and indeed, frequently do, present to us two entirely distinct orders of phenomenal properties, some of which are essential to their substance, and specify it individually, instead of which the others are only accidental attributes. The first belong to the molecular constituent groups. They subsist and are preserved unaltered in all the states of physical disaggregation which the masses can be made to undergo, without their intimate constitution being modified. The other properties, on the contrary, which may be called contingent, accidentally belong to the whole of the groups forming the sensible mass of the body under consideration. They characterise its actual volume, its total weight, its dimensions, its form, its more or less regular and more or less resisting state of aggregation. They may be modified at pleasure, by mechanical processes, without the molecular properties experiencing any alteration. The latter alone forms the subject of chemical studies. A body of perceptible dimensions is chemically homogeneous when its molecular constituent groups are identical among themselves; it is chemically heterogeneous when they are dissimilar; and when this dissimilarity of groups exists between two chemically homogeneous bodies, it renders them chemically different. They may, therefore, be such by a difference of nature among the material elements which compose their constituent groups, by a different arrangement of the secondary groups of which the latter are composed, by an inequality either of the quantity or of the condition of the imponderable principles which may be internally associated with them, or, indeed, by various combined circumstances.

The minuteness of the molecular groups rendering them imperceptible to our eyes, even with the assistance of the most powerful microscopes, their diversity cannot be characterised, or even detected, except by the difference of the sensible effects operated by the dynamic forces which emanate from them. These effects are of two kinds: physical and chemical. The former, peculiar to certain substances, consist in the deviations which their molecular groups cause in the planes of the polarisation of the luminous rays, by virtue of an especial power which they individually exercise, and whose energy and direction of deviation are independent of the actual state of aggregation established between them. This power, which I have called rotatory, is exercised without decomposition of the active groups. The chemical effects, on the contrary, consist in reactions operated between molecular groups of different nature, or of different constitution, and according to which new groups are found to be formed, either by the simple association of primitive groups in a new system, into which they enter without being individually decomposed, or by a separation of their material elements, and their reorganisation in groups differently composed. My object is to show how these modifications of primitive groups may be manifested and characterised by the observation of the rotatory power, when it precedes them or results from them. For this purpose, it is necessary for me to analyse the mechanical mode by which they are accomplished, and to specify their principal laws at present known.

Conformably to this plan, I first call to mind, and define the external and perceptible conditions in which chemical phenomena are seen to operate, in order to distinguish those which are indispensable to their accomplishment, as disaggregation, independence and freedom of motion in the molecular groups, from those which only determine or excite, as the proper and mutual attraction of these groups, as well as the actions which may be exerted on them by the imponderable principles which are combined with, or interposed in them. On this subject, I develope, in detail, the possibility that chemical attraction, although perceptible only at inappreciable distances,

might derive from universal gravitation only, modified in the expression of its results by the proximity of the molecular groups, compared with their own dimensions; the same as the precession of equinoxes, and the nutation of the terrestrial axis, which are indubitably operated by this single force, decrease as the cubes and not as the square of the distances which separate the reacting bodies.

Having thus established the general conditions of chemical reactions, with all the indetermination of quantities which their peculiarities cause, I select the most simple mode of composition that the act of combination can operate. I consider only two composing substances, both chemically homogeneous. I then suppose that a combination is formed in certain proportions, into which each kind of group enters integrally, although their material elements may afterwards be separated into each group of the product formed, so that certain other arrangements may take place. And I add, for the last condition, that the product formed is itself chemically homogeneous; that is to say, it contains only one order of compound groups, identical among themselves. Finally, I examine in what cases it may be presumed that this simplicity of circumstances is realised. But I here confine myself to establishing it as a basis for argument.

In these conditions, each group can contain only a certain system of entire multiples of the constituent groups. This mode of composition immediately gives the most general expression of its absolute, individual weight, by virtue of the analogous weights of the constituent groups, multiplied by entire, positive, indeterminate co-efficients.

But the indetermination is limited by ponderal analysis, performed on appreciable bulks. Indeed the product being supposed to contain only groups of a single order, consequently of a single numerical form, the ponderal proportions of the constituent principles are, in every compound group, the same as in the total product. Deriving, therefore, these proportions from chemical analysis, I introduce them into the expression of the individual weight of the compound group. It is then found to be the product of two factors: the one, numerical and known, is exactly the atomic or proportional number of chemists; the other remains completely undetermined; chemical analysis is unable to give any notion concerning its value.

This result being established as far as regards binary compounds, I extend it to multiple compounds, but always under the same restriction,—that the product contain only a single order of compound groups. Passing thence to the case in which it contains several orders, I show that the indetermination would be still greater. For their ponderal analysis, performed on appreciable bulks, could no longer be available with the same groups, individually considered. It would give only a mean condition of ponderal proportions to be divided among them, without giving any idea whatever as to the manner in which this division is to be made.

Although these mathematical considerations might in themselves be sufficient for proving that the representative numbers of chemists are not proportional to the weight of the real molecular groups, and that they have no accessible relation to them, even hypothetically, I have been desirous of rendering this consequence still more evident by applying them to true combinations. But, for that purpose, it was necessary to select such as might fairly be presumed to contain molecular groups of a single order, and not of various orders.

This character of identity or of diversity, not being able to be accounted for, according to the single ponderal analysis of the products, always performed on appreciable quantities, we must draw our conclusions from other indications. We find, in the phenomena, if not absolutely certain, at least extremely probable, stability, or mutability, which the combinations present when submitted to external, physical, or chemical actions; as also in the more or less distinct diversity of the products which they form, and of the particular circumstances which determine them. For example, if one volume of oxygen gas, and two of hydrogen, be mixed together, in equal conditions of pressure and temperature, and if an electric spark be made to traverse this mixture, or if it be put in contact with a solid incandescent body, or if it be strongly compressed, by suddenly diminishing the space which it occupies, which may be effected by means of heat, it immediately inflames without explosion, disengaging much heat and light; after which, no free gas is found, but water, which has been formed by their combination, and whose weight equals theirs. When the mixture of the two gases is made in proportions somewhat differing from those indicated above, water is still formed, and always in the same fixed proportions. That of the two gases which is in excess, remains in the state of free gas, to the amount of its excess. But when the excess goes beyond certain limits, the combination between the quantities present of the two gases is but partially operated; so that some of each remains free. Nevertheless, the quantities combined are still in the same relative proportions as above, and the product is water, of a weight equal to their sum. Now, if this water be heated, until it is converted into steam, or if it be congealed by cooling, it undergoes neither

entire nor partial decomposition; but it may be decomposed in the first of these states, by being passed over metals which have a great affinity for oxygen, where kept at a red heat, as iron, for example. Then the weight of the oxygen absorbed, and that of the hydrogen set free, are exactly in the relation which the above expressed proportion of the volume supposes; so that the mass of vapour which has not been decomposed, has not undergone any alteration in the ponderal proportion of its constituent principles. However, and this discovery is due to M. Thenard, by making the water and oxygen depart from the combinations in which they exist, so that they are found in contact at the moment when they both become free, the combination of this water with a fresh quantity of oxygen may be determined, which repeated operations make us arrive at a weight exactly double that which it at first contained, without this term being exceeded. Thus we obtain a new, colourless, inodorous liquid, like water; but which is distinguished from it by its physical and chemical properties. For example it is denser than water, less volatile, and does not congeal at a temperature of 30° below zero. But it very readily yields its excess of oxygen to bodies which have the slightest affinity for it. It gives it up, even on the contact of metals which have no perceptible action on natural water; and, after this excess is disengaged, the remainder is found to be water in its primitive condition. The readiness of the latter to be formed at first, with the fixed proportions of the volumes of the two gases; its obstinate preservation of these proportions, under the influence of very powerful physical and chemical actions; and, finally, its disposition and uniformity, when combined with a larger proportion of oxygen; are not these, therefore, characters which indicate, with the greatest probability, a strictly defined and peculiarly stable primitive constitution of molecular groups, of a more ready formation than any other, and thus ought to exist alone, in preference, when it can be freely constituted? All simple substances, that is to say all substances which, as yet have not been decomposed, thus form with one another combinations in different proportions, distinctly defined by their numerical intervals, by their different properties, by their individual stability, by the speciality of the circumstances which determine every one of them, and by their invariable return to some one of these fixed terms, when incompletely decomposed. These are therefore what chemists call combinations of different orders. It is very probable, then, that each of these products is composed of a single kind of molecular groups identical between themselves; and it is, at all events, the least complex constitution that can be attributed to them. But other compounds also are met with, particularly organic ones, whose molecular constitution does not seem to present such complete unity, still retaining an exact uniformity of ponderal composition. Thus, many essential oils evaporated, and afterwards partially returned to the liquid state, at different periods of their distillation, separate into products, which their action on polarised light shows to be composed of different molecular groups, although their total ponderal composition is absolutely the same. On repeating the distillation of these unstable compounds, they are found continually to undergo molecular modifications; but with others, this modification does not go beyond a certain extent, as may be ascertained from the permanence of their optical properties. It might be presumed, then, that the latter contain only a single kind of molecular groups identical among themselves; instead of which, so far from that, they contain various kinds, subject to similar ponderal proportions, but formed of more or less complex multiples of a similar numerical form, as chemists have often been led to suppose; or, perhaps, identical as to numerical form, with a different internal arrangement of material elements. Nevertheless, in such cases, the supposition of the identity of the groups in the product which has become uniform, no longer relies on indications so characteristic as the combinations of different orders, with irregular intervals, separated from one another by uniform, well defined, distinct numerical proportions, as also by the speciality of the circumstances which cause each of these orders to be separately constituted.

I return, therefore, to the latter; and, as an example, I may take the various known combinations of nitrogen, sulphur and carbon with oxygen. Considering each of them as a compound of a single order of molecular groups, I introduce the results of the chemical analysis into the individual expression of their absolute weight; then I put the amount of these weights, thus obtained, in comparison with the equivalents, or atomic weights attributed to the same products; and I show by numbers, that which I formerly demonstrated by algebraic formulæ, namely: that there is no necessary proportion, nor even legitimately supposable relation, between the equivalents, as they are calculated, and the weights of the real molecular groups. As a confirmation of this, I may mention that, after what has been said above, the non-identity of the groups in each product, if it were wished to admit it by way of hypothesis, would but render these relations still more distinct.

This furnishes me with an opportunity of

introducing the literal notation generally adopted by chemists for expressing the ponderal composition of their products. I will show its utility, and the distinct applications, as well as the classification of each series of products of different orders, formed by the same substances, as the manifestation of its analogical relations with all the others. The rational use of notation, for this high object—the highest, indeed, that chemistry proposes to attain—presents one of those examples, so common in accurate sciences, of the influence which correct notations exert on the mind in suggesting ideas, and in developing abstract or phenomenal relations, whose existence is found implicitly, but not intentionally comprised in their conception. However, written signs fix incorrect ideas as firmly as they do correct ones, which renders their introduction extremely dangerous. This is the reason why, relying on the above, I would point out how many fictions and illusions, fatal to the progress of rational chemistry, may the expression "Atomic Weights" give rise to, when substituted for that of chemical equivalents first employed by Wollaston, and with so much propriety, when, indeed, these fictitious weights have no tangible physical connexion with the true weights of real molecular groups.

By characterising these groups as to simple, or hitherto undecomposable substances like corpuscules which enter internally into all combinations with the formation of which we are acquainted, I do not mean to say that they were not materially subdivisibles; for their constitution, on the contrary, may be so very complex, that we have no means of separating their constituent elements, in such a manner as to enable us to examine them separately; and this separation might even be operated in some of the combinations in which they are engaged, without subsisting after they are disunited. But in confining ourselves to the consideration of these groups in their natural individuality, that is to say, as the last term of subdivision that each substance is capable of undergoing, without being chemically altered in its nature, we are never certain of obtaining them as simplified, even when we put substances into the gaseous state. For the molecular groups which physically constitute them in this state, might indeed be very numerous multiples of their ultimate chemical groups, whose complication would vary with the temperature. Without prejudging anything as to the possible extent of the various agglomerations, we have at least, in the gaseous state, the last degree of physical attenuation that we are able to produce; and we should conclude that the mechanical laws of combinations will be manifested with greater simplicity in that state, than in any other. Now, indeed, this induction receives a very remarkable confirmation from the following fact, which was discovered and proved by M. Gay-Lussac, namely: that the aëriform products resulting from the combination of several other gases, being considered in the same circumstances of pressure and temperature as their constituent principles, always contain, under a given volume, a sum of entire multiples, or of very simple submultiples, of volumes of these principles. And, as all the gases hitherto studied are equally affected by equal variations of pressure and temperature, the ponderal composition of a volume, thus expressed, gives, under the same simple form, the density of the product in the gaseous state, by the function of the density of the constituent gases. The same, when the product is not presented in that state, if it be analysed as it exists, it is always found formed of proportions of very simple volumes of the substances which compose it; and this simplicity of relations is so evident, and so general, that it ought in all probability to be considered as inherent to the mechanical conditions by which the combinations are operated in the state of gas.

This result is so important in itself, and so fecund in its consequences, that before introducing it into the ponderal expressions of complex molecular groups, I thought it useful to effect a strict numerical verification for various gaseous combinations, where it may completely experience it, in order to prove by the same numbers, whether, in the present state of our knowledge, it may be admitted as an absolute natural law, or only as an approximative one, which, in a theoretical point of view, constitutes an important distinction.

This verification is very easy, when the densities of the constituent gases are known, as well as that of their gaseous product, and the proportion of volumes according to which they combine to form it. Let us take as an example, the formation of water: according to the experiments of MM. Humboldt and Gay-Lussac, the proportion of the volumes is two of hydrogen to one of oxygen. The densities of these gases are known. Let us adopt those of MM. Dulong and Berzelius: the density of aqueous vapor is directly calculated from experiments very carefully made by M. Gay-Lussac. By combining these data by calculation, we find that one volume of oxygen gas, combined with two volumes of hydrogen gas, very approximatively constitute two volumes of steam, which is indeed a very simple relation. But, keeping to the accuracy of these numbers, these two volumes of steam would really result from 1·0056 of oxygen, combined with 2·0113 of hydrogen gas. The difference of this from the simple result, doubtless would

be unimportant in common experiments; and it is, besides, suspected of all the little errors which affect the experimental data employed in the calculation. But among these data is found the simple proportion of the volumes. Is it ascertained that it is accurate in the thousandths? And to what decimal can it answer?

Here are other examples. Chemists generally admit that oxygen gas does not change volume when sulphur is combined with it in order to form sulphurous acid gas, and with carbon to form carbonic acid gas. Let us first take the former case. M. Thenard has determined the density of sulphurous acid gas, by three experiments, which he says have varied from one another only in the thousandths. Again, M. Berzelius has very carefully made the ponderal analysis of this gas; and indeed the density of oxygen gas seems to be very well known, since that which MM. Dulong and Berzelius have ascribed to it scarcely differs from that which M. Arago and myself obtained. Combine these data; they will show that one volume of sulphurous acid gas does not contain exactly a volume of oxygen gas, but 1·01 of a volume, which would be very different for the law of simplicity of relations. Indeed, there were, without doubt, little errors in the ponderal analysis of the product, and in the measure of its density. Might not the sulphurous acid gas also, when weighed, be too near its point of liquefaction, for the general law of dilatation of permanent gas to apply to it very strictly? Or, might not the vapor of sulphur, which, according to M. Dumas' experiments is so dense, have carried into its combination with oxygen, some traces of that complication which is generally manifested in the state of liquidity? All these things are possible; as also it might be that repeated and still more accurate experiments might do away with this deficiency of 1-100dth of volume. But it would not be more improbable that, in its combination with sulphur, oxygen gas might contract to that extent. And, indeed, M. Gay-Lussac says, he has found that 100 parts in volume of this gas have always given him rather less than 100 parts of sulphurous acid gas.

The results of the combustion of carbon, published by MM. Dumas and Stass, have lead to a similar consequence*. If their numbers be employed, with the densities of oxygen and carbonic acid gas of MM. Dulong and Berzelius, it is found that one volume of the latter gas does not contain, as is generally supposed, one exact volume of oxygen gas, but 1·00556, so that there would again be a slight contraction of this gas in the combustion of the carbon. The densities found by M. Arago and myself, would reduce this number to 1·00143; that is to say, they would diminish its difference four times, leaving it in the same direction. And also, as to the composition of aqueous vapor, they would reduce the deficiency of the simple law to less than half, giving it a contrary direction. But, notwithstanding the care M. Arago and myself bestowed on our determinations, I dare not consider them more accurate, or even as accurate as those of M. Dulong and Berzelius, made so many years afterwards, with all the assistance that the perfect state of physics and chemistry could lend them, and applied by themselves.

It will not be thought, I hope, and least of all by M. Gay Lussac, that the preceding reflections tend to diminish the importance of his remark concerning the simplicity of the proportions of volumes in which gases combine with one another. I demand, on the contrary, that experiments be now made, if possible, sufficiently accurate to raise this simplicity, if it be possible, to the rank of natural and absolute laws, or to fix the limit of its accuracy, if it fall short of it. A case is here met with, similar to that of the geometricians, immediately after the discovery of attraction. It was of the last importance to know whether the simple law of the square of distances was or was not accurate; and it could be decided only by deducing from its application the most complex planetary phenomena. An imperfect calculation at first caused it to be supposed, that it gave only the half of the motion of the lunar apogee, and it was doubted whether some alteration might not be made, so as especially to apply it to this satellite. But a further approximation proved that it gave the whole motion of the entire apogee; and the same accuracy of deduction, afterwards carried into all the details of planetary motions, has raised it to the first rank of natural laws. M. Gay-Lussac will not disapprove of my also reclaiming the strict proofs which may give a similar character to the simplicity of relations which he first recognised. And if the greatness of the example which I have called to mind authorises me here to express all my ideas on this subject, I dare say, in general, that by endeavouring, as is now done, to give to ponderal analysis the utmost degree of accuracy that can be attained to, it would not always be necessary too obstinately to subject its numerical results to conditions of simplicity, which sometimes might have only a very high degree of approximation, especially in the

* According to the experiments of these two gentlemen, the ponderal proportion of the carbon to the oxygen, in carbonic acid, is 75·200dths, or 3-8ths. See *The Chemist*, vol. 1, page 329.

most complex products, without they are required to be absolutely accurate to the indications of the real phenomena may disappear, which it would he highly important to follow, in order to throw some light on the mechanism of combinations.

The preceding discussion being terminated, I return to the ponderal expressions of the real molecular groups which constitute compound products; and, considering their component principles in the gaseous state, I therein express the proportions of the weight of these principles, by relations of volume. It is seen hy the very formulæ that the weights of the groups,—simple as well as complex,—cannot generally be considered as proportional to the densities of the media which they would constitute in the gaseous state; which would put them in the same number at equal volume. This equality could occur only under very peculiar numerical conditions, and experiment contradicts it in many instances, as M. Dumas, I think first remarked. The introduction of the relations of volumes besides changes nothing of the absolute weight of compound groups, since it expresses the same ponderal proportions, only under another form; and the amounts of these weights do not remain less inevitably indeterminate. But this new form, changing the literal expressions of products, in chemical notation, presents their individual composition under a more tangible physical aspect, and manifests between them very profound analogies which the abstract expression of the ponderal proportions had not indicated. This I have endeavoured to shew in the very series of combinations which I have taken as examples.

If I am not mistaken in this exposition, which I have endeavoured to read or free from all hypothesis, we ought to consider it as certain that the chemical equivalents of different substances or their atomic weights, now in use, as they are called, have no relation, I do not say only as to proportion, but no relation whatever, known or determinable, to the weights of the real molecular groups which chemically constitute bodies. I hasten to add that this conclusion has been fully confirmed by numerous experiments which I made with the intention of proving it, the general results of which I shall hereafter have occasion to mentiou. But then, seeiug that these numbers are of such extensive utility, and of such evident service in expressing the laws of successive derivation of compouuds of various orders, in every series of products, as also in manifesting the analogies of different series among themselves, we are led to enquire whether it would not he accessible to attach to them some other physical notion which might explain, or, at least, might show in what quality they intervene iu the mechanism of combinations; in order that thence might be inferred the conditions of choice most proper for giving them a really phenomenal character. This specification is much more difficult to fix than to exclude that which is attributed to them. As, without assumiug to myself the power of estahlishing it, I will merely try, in a future lecture, at least to open the way which one day may lead to it. For that purpose, I will call to mind the different physical and chemical considerations hy which the values at present attributed to equivalents are determined, or which it is proposed to employ as a general principle of their selection. I will investigate the common characters which these determinations give them; and in confirmiug by this inverse proof, that they cannot have a molecular application, I will endeavour to show what would he, in the present state of our knowledge, the most prohable mode of intervention which could be attributed to them in the mechanism of combinations.

INVESTIGATIONS CONCERNING THE CHEMICAL COMPOSITION OF THE BRAIN OF MAN.

BY M. E. FREMY.

The great extent of my researches compels me to divide my work into two parts. In the first I give the composition and nature of the different fatty matters which may be extracted from the brain, explaining the processes which I have adopted for purifying them. As this first part is fundamental, and as it is upon it that I shall rely for estahlishing the composition of the brain of animals, and for ascertaining the alterations that it undergoes iu disease, I was desirous of submitting it to the Academy.

In my memoir, I begin by calling to mind the works on the brain which have heen puhlished, and, stopping at that of M. Couërbe, I endeavour to demonstrate the impurity of the bodies which that chemist considers as immediate products.

After this preamhle, in which I acknowledge, however, that it is to M. Couërbe we owe the important discovery of cholesterine in the hrain, I proceed to the explanation of the different processes which I have used for extracting the fatty matters from the hrain, for purifying them and for ascertaining their proportions.

* *Academy of Sciences*, Paris: Sitting of Nov. 9. 1840; from *Comptes, Rendus, No.* 1.

From my analysis it results that the brain of man is formed of a considerable quantity of water and of matter insoluble in ether, which I designate albuminous matter. The portion soluble in either is principally formed of three matters : —

1st. Of the white matter discovered by Vauquelin, in which I have detected well defined acid properties, and which I call *cerebric acid;*

2nd. Of a liquid fatty matter, which has the composition and all the properties of the oleïne of human fat, analysed by M. Chevreul ;

3rd. Of Cholesterine.

There is also found in the brain very small and variable quantities of margaric and oleïc acids, of cerebrate of soda, and of albuminous matter.

In order to arrive at this result, I have employed various analytical processes, which I described in my memoir : I may here give that which appears to me the most simple.

I cut the brain into small pieces, I boil it several times in alcohol, and I allow it to remain for a few days in that liquid.

The object of this operation is to remove the water contained in the brain, and to coagulate the albumen. The cerebral mass has then lost its elasticity, and may be submitted to pressure. The alcoholic liquors retain only traces of cerebric acid, which may be extracted by filtration.

The brain is then exhausted by means of boiling ether, the ethereal liquors are combined and evaporated. The residue of the evaporation is treated by boiling alcohol, which removes the oleïne, the cerebric acid, the cholesterine and the margaric and oleïc acids. On the liquor being cooled, the cholesterine and the cerebric acid are deposited : these two matters are separated by means of cold ether, which very readily dissolves the cholesterine, and leaves the cerebric acid. The cold alcohol retains in solution the oleïne, and the oleïc and margaric acids ; this alcohol is evaporated, being rendered slightly alkaline by ammonia ; at a certain period of the evaporation, oleïne is deposited, and oleate and margarate of ammonia remain in solution.

As to the portion which is insoluble in alcohol, and which is formed of albumen and cerebrate of soda, it is boiled with alcohol containing a little hydrochloric acid, which decomposes the cerebrate of soda : the cerebric acid, thus set free, very readily dissolves in the alcohol. There then remains a coloured matter, of an albuminous nature, which contains sulphur, but never phosphorus.

After having thus settled the composition of the fatty matters of the brain, I have prepared, by M. Couërbe's process, the bodies which he considers as pure substances, and I have endeavoured to show their impurity by direct experiments. Thus, I have ascertained that the body which he calls *eleëncephol,* is only a mixture of oleïne and cerebrate of soda. I first proved it by treating this body by an alcoholic solution of potassa, which saponifies the oleïne, converts it into oleïc acid, and which allows the alkaline cerebrate to precipitate. On this occasion I made an experiment, which to me appeared decisive : I procured a sample of *eleëncephol,* prepared by M. Couërbe himself, for which I am indebted to the kindness of M. Guerin ; I treated it by absolute alcohol, which dissolved the oleïne. allowing a viseous matter to precipitate, which was no other than cerebrate of soda.

I have ascertained, by a similar method, that the *cephalote* of M. Couërbe is a mixture of oleïne, cerebrate of soda, and traces of albumen. I have ascertained also that his *stearoconote* is formed of a mixture of albumen and cerebrate of soda, by boiling it with alcohol acidulated by hydrochloric acid, which removes the cerebric acid, and leaves the albuminous matter.

By analysing brains in different states and at different ages, I have found that the quantity of free fatty acid contained in the brain is very variable ; and that it often increased when the fatty matters were left for some time in a closed flask. I have found an explanation of this curious phenomenon : profiting by the observations made by M. Chevreul on the fat of a human body, and by the memoir which MM. Pelouze and S. Boudet published on the spontaneous saponification of palm oil.

I have seen that it was the albuminous matter of the brain that had the property of converting, by long operation, oleïne into oleïc acid.

Finally, I have discovered what part of the brain contains most fatty matter, and analysis has shown me that all the fatty bodies are found in the white matter of the brain, and that the grey matter contains only traces of it. When the fatty bodies are removed from the white matter by means of alcohol, a mass is obtained in all respects similar to the grey matter. If, therefore, it be desirable to represent the anatomy of the brain in a chemical point of view, it might be said that the part which, as it were, forms the basis of the brain is primitively grey ; and that it is the fatty matter, which, diffused in the interior of the grey matters, forms those white belts, constituting the white part of the brain.

It is not my intention, however, to enter into the physiological question ; but M. Magendie, who has been kind enough to furnish me with the anatomical materials necessary for my work, has promised me to take into consideration such questions as

may be interesting in a physiological point of view, when my chemical documents are complete.

NEW MODE OF ESTIMATING NITROGEN IN ORGANIC ANALYSIS.*

BY PROF. BUNSEN.

Professor Bunsen showed that the qualitative methods at present employed for the analysis of bodies containing nitrogen were defective, it being impossible to adopt these processes when the nitrogen and carbon are in small proportion to each other. His process consists in introducing the substance to be analyzed into a glass tube, after having mixed it with oxide of copper.

A few slips of metallic copper are then added, and the tube is fixed to Döbereiner's apparatus for generating hydrogen. This gas is passed through it until all the atmospheric air is expelled, giving the tube a rotatory motion at the same time, in order to dislodge any air which may be retained between the particles of the oxide of copper. The tube is then hermetically sealed, and introduced into an iron vessel filled with gypsum. The gypsum must be moist when the tube is introduced, in order that it may be firmly fixed in it. Prepared in this manner, it is introduced into the oven used for organic analysis, and surrounded with red-hot coals. If the tube be of strong green glass it will not burst.

When the combustion is finished, the tube must be placed under a graduated glass receiver standing over mercury, and the point cut off. The gas, which was under the pressure of several atmospheres, rushes into the jar. The carbonic acid is absorbed by hydrate of potassa, which is introduced into it, and the remaining gas must be nitrogen, as all the hydrogen must have been converted into water by the oxygen of the oxide of copper.

The results obtained by this method agree with theory to the second, and frequently to the third decimal place.

ON THE QUANTITY OF CARBONIC ACID THROWN OFF FROM THE LUNGS IN HEALTH AND DISEASE.

BY MR. M'GREGOR.†

Mr. M'Gregor read a paper detailing some experiments performed by him, while residing in the Royal infirmary of Glasgow, with a view to ascertain whether the quantity of carbonic acid thrown off from the lungs differed in health and disease. In health he found the mean per cent. to be 3·5 per cent., a quantity which very nearly corresponds with that of Dr. Thompson, of Glasgow, and Dr. Apjohn of Dublin; that found by the former being 3·72 as a mean ultimate result, while that of the latter was 3·6.

In the eruptive stages of small-pox, measles, and scarlet fever, the amount of carbonic acid evolved from the lungs was considerably increased; in the former to from 6 to 8 per cent., in the two latter to from 4 to 5 per cent.

During the aggress and climax of these diseases, the per centage of carbonic acid showed the above increase; while in proportion as convalescence established itself, and the skin resumed its normal appearance, the per centage of carbonic acid gradually diminished.

Ten cases of each of the above specified diseases were so examined. In chronic skin diseases an augmentation was also observed; and in one case of ichthyosis, the mean per centage amounted to 7·2 per cent. The scaliness in that case was universal, and ultimately proved fatal. In diabetes melitus, a disease in which the aliment is converted into sugar, and eliminated in the form of urea and sugar, no normal aberration could be detected, the carbon in that case being eliminated in the form of sugar and urea.

ON A NEW COMPOUND OF DEUTOCHLORIDE OF PLATINUM NITRIC OXIDE AND HYDROCHLORIC ACID.*

BY HENRY D. ROGERS AND MARTIN H. BOYE.

This substance is procured by dissolving platinum in an excess of nitromuriatic acid, and evaporating nearly to dryness; after which it is treated with aqua regia, freshly prepared, from concentrated hydrochloric and nitrid acids. A little water is afterwards added, drop by drop, just sufficient to keep the chloride of platinum dissolved, when the compound will remain in the form of a gamboge yellow powder. It is then separated by decanting and filtering, and pressed between the folds of bibulous paper, and dried *in vacuo* over sulphuric acid.

The precipitate is a yellow, minutely crystalline powder, which absorbs water with great avidity. It may be preserved, without decomposition, in dry air, or *in vacuo*. It is decomposed by water, alcohol,

* *British Association.*

† *British Association.* From *The Athenæum.*

* From *Silliman's Journal.*

&c., with extrication of nitric oxide, chloride of platinum remaining in solution. A concentrated solution of chloride of platinum has, however, no action on it. Heated in an atmosphere of hydrogen, it gives off a large amount of chloride of ammonium, leaving a residuum of metallic platinum.

ANALYSIS.

The salt analysed, was prepared and kept in the manner described. Heated to the temperature of 212° F., it does not part with any of its water of combination. For estimating the amount of platinum and chlorine, the salt was fused with carbonate of potassa, &c., and the platinum, thus obtained, weighed by itself, and the chlorine precipitated from the solution by nitrate of silver.

The quantity of nitric oxide was determined by introducing a portion of the salt into a graduated tube, inverted into mercury, and decomposing it by letting up the requisite proportion of water.

The mean of a series of experiments, varied in different ways, gave

Platinum..... 41·26 per cent.
Chlorine ..... 43·89 ,,
Nitric oxide .. 4·98 ,,

The above results correspond to five atoms of bichloride of platinum; five atoms hydrochloric acid, and two atoms of nitric oxide. The water was calculated, from the loss in the analysis, to be equivalent to ten atoms.

Respecting the chemical nature of this compound, it may be regarded, either as a chloride of platinum, with a muriate of nitric oxide, represented by the following formula, $(Pt\ Cl^2)^5 + [(Cl\ H)^5 + (NO^2)^2] + 10$ Aq. or as a double chloro-salt, a chloro-platinate of nitrogen, with a chloro-platinate of hydrogen, represented by the formula, $[(Pt\ Cl^2)^2 + N\ Cl^2]^2 + (Pt\ Cl^2 + H\ Cl) + 14$ Aq.

ON THE PREPARATION OF ALLOXAN, ALLOXANTINE, THIONURATE OF AMMONIA, URAMILE, AND MUREXIDE.*

BY PROF. GREGORY.

To prepare alloxan from uric acid, Liebig and Wöhler used nitric acid sp. g. 1·42, and separated the acid liquid from the crystals by means of a porous brick, thus losing the whole mother liquid. The author uses nitric acid of sp. g. 1·35. The action of this acid on uric acid must be kept moderate. When crystals of alloxan are formed, the whole is thrown on a filter, the throat of which is stopped with asbestus. That portion of the acid liquid which remains in the crystals is displayed by a few drops of cold water, and the crystals are purified by recrystallization. The liquid is again employed in the same way, and the crystals collected as before.

Five such operations may be performed with the same liquid, each yielding a large crop of crystals; while the mother liquid is preserved, and yields a large quantity of parabanic acid, or oxalurate of ammonia. By this process the author obtains from 100 parts of uric acid, 65 of anhydrous alloxan, or 90 of alloxan + 6 aq. From alloxan, alloxantine is easily obtained by the action of sulphuretted hydrogen.

Thionurate of ammonia is easily formed, by boiling a solution of alloxan with sulphite of ammonia and free ammonia. Uramile is also easily obtained, by boiling a solution of thionurate of ammonia, with an excess of diluted sulphuric acid. Murexide is obtained, as described by Prof. Gregory elsewhere.

He now exhibited the last three processes. He also stated, that the theory of the formation of murexide was of great importance in reference to organic colouring matters.

* *British Association*, Sept. 1840; From *The Athenæum*.

ON THE ESSENTIAL OILS OF BLACK MUSTARD AND COCHLEARIA.*

BY J. E. SIMON.

Mr. Simon admits, that when the sulphur is removed by means of dry or hydrated oxide of lead, or by means of the binoxide of mercury, from the crystalline combinations of the essential oil of black mustard and ammonia, two basic bodies are produced—one solid, the other unctuous. MM. Robiquet and Bussy mention only one in their work. The unctuous base is soluble in water, alcohol and ether, whilst the solid base is soluble only in water; it is but little soluble in alcohol, and not at all so in ether. The latter agent, therefore, presents the best means of separating them.

It is also a peculiarity of the combination of essential oil of mustard and ammonia to give by distillation with sulphuric acid, an acid which acts on oxide of iron like sulphohydrocyanic acid.

The substance which is obtained when the sulphur is extracted from the oil itself is also very remarkable. It is a crystallizable

* *Annalen der Physik und Chemie*, vol. L. p. 377.

body, readily soluble in alcohol and in ether. Mr. Simon calls it *sinapoline*, from *sinapis* and *oleum*. It may he distilled with water, without decomposition; it melts at 90° C, and afterwards sublimes, and is decomposed at 170—180° C. It dissolves at the ordinary temperature in sulphuric and nitric acids; but at a higher temperature, the former acid turns it brown, whilst the latter converts it into a new acid.

The essential oil of cochlearia has to that of mustard a resemblance analogous to that which essential oil of laurel, has to oil of hitter almonds.

Essential oil of cochlearia forms with ammonia a crystallizable compound, whose crystals, according to M. Mitscherlich's examination, greatly resemble those of the ammoniacal compound of essential oil of mustard.

If, by means of any of the indicated agents, the sulphur he removed from these crystals, two bases are formed—the one unctuous, and the other solid—separahle from one another by the ahovementioned means.

This oil also furnishes hy its desulphuration a crystallizable body, soluble in ether, in alcohol, and in water, and in all respects resembling sinapoline.

But the boiling point of these oils is different.

Mustard oil boils at....143° C.

Cochlearia oil at .....156—159° C.

Cochlearia loses, as we know, all its smell by desiccation, and, consequently, it is regarded as inert, when in the dry state. This alteration has hitherto heen attributed to the volatile nature of the essential oil; hut it is not so. Probahly the albumen of this plant acts the part of the myrosine in the mustard seed, and perhaps it is this that is altered hy desiccation. If dry cochlearia be distilled with water, an inert and insipid product is obtained; but if there be added to the water myrosine procured from white mustard, an oil, like that of fresh cochlearia is ohtained.

M. Simon makes mention of an acid capahle of heing distilled, and which may he ohtained by water rendered alkaline by carhonate of soda. In this case there is in combination with the soda an acid, which acts on a solution of silver, like formic acid, hut which is distinguished from it by the greater solubility of the salt which it forms with lead, as well as hy its different crystallization. The author proposes for this, the name of *sinapinic acid*.

ON BIMALATE OF AMMONIA.

BY L. A. BUCHNER, JUN.

By adding a solution of malic acid to a solution of neutral malate of ammonia, after proper concentration, large crystals of bimalate of ammonia are obtained.

M. Liehig, relying on the facility with which this salt crystallizes, has proposed the following method for the preparation of pure malic acid. Crude malate of lead, obtained by precipitation, from the juice of the berries of the sorb tree with tribasic acetate of lead, is decomposed hy means of dilute sulphuric acid; the liquid acid is filtered, and half of it is perfectly saturated with pure or carbonated ammonia; the other half is then added, and the liquor is then evaporated to crystallization. The crystals ohtained are purified by a second crystallization, and decomposed by acetate of lead. The pure malate of lead is afterwards decomposed by sulphuric acid, or by sulphuretted hydrogen, &c.

In this manner I have prepared pure malic acid with a large quautity of sorb berries, and I can affirm, that I know not a simpler or hetter method. Indeed, the bitartrate and the hinoxalate of ammonia are difficultly soluble in cold water, and crystallize only in small prisms; the hicitrate of ammonia does not crystallize at all, hut forms, according to my experiments, only a syrupy hygroscopic mass; so that these salts may easily be separated from bimalate of ammonia, if their acids exist in the sorb berries. The beauty of the crystals of bimalate of ammonia which I obtained by this operation, determined me to request professor Kohell to submit them to a crystallographic examination. The result ohtained by that learned crystallographer is as follows:—

The crystals belong to the rhomhic system. The most ordinary combination, according to the formulæ of Mohr and Naumann is

$$\infty P,\ \infty P\infty,\ P\infty,\ \tfrac{1}{2}P\infty.$$

The angles are,

$$\infty P = 110^0.$$
$$P\infty = 107^0.$$
$$\tfrac{1}{2}P\infty = 139^0\,24'.$$

The crystals appear by predominant extension of the faces $\infty P\infty$, as sharpened rectangular tahles. They are perfectly cleavahle according to ∞P, imperfectly cleavahle according to $\infty P\infty\ \infty$, not cleavable according to $\infty P\infty$.

I made an analysis of bi-malate of ammonia in the following manner:—

1st. A certain quantity of the salt, for some time exposed to a current of dry air at 100°, lost nothing in weight. At a higher temperature, it disengaged ammonia.

2nd. 0·471 grammes gave hy comhustion with oxide of copper, 0·558 of carhonic acid

and 0·250 of water. Hence the salt would contain per cent—

Carbon.....	32·69
Hydrogen	6·07
Oxygen and nitrogen	61·24

3rd. 0·61 grammes, dissolved in a little dilute hydro-chloric acid, and precipitated with an alcoholic solution of chlorine of platinum, gave a precipitate, which, washed with alcohol and calcined, left 0·395 of metallic platinum. That corresponds to 0·0688 of ammonia = to 11·27 per cent.

According to this analysis, himalate of ammonia is composed of

1 equiv.	Ammonia..	= 214·47
2 ,,	Water	= 224·96
2 ,,	Malic acid..	=1461·42

$$N, H\,6 + 2\,\overline{Ml} + 2H_2O = 1900{\cdot}85$$

It contains per cent.

Ammonia 11·28	containing	1·97 H
Water .. 11·84	,,	1·31 ,,
Malic acid 76·88	,,	2·63 ,, &32·17C
100	,,	5·98 H &32 17C

The rational formula for this salt should be: $(N2\,H\,8\,O + \overline{Ml}) + (H\,2\,O + \overline{Ml})$, that is to say, a combination of neutral malate of ammonia with hydrated malic acid.

Bimalate of ammonia possesses an acid and agreeable saline taste; it is very soluble in water, and insoluble in alcohol and in ether.

ON THE IDENTITY OF SPIROILOUS AND SALICULOUS ACIDS.*

BY DR. ETTLING.

The oil discovered by M. Pagenstecher, and obtained by distilling the *spiræa ulmaria*, has already attracted much attention. Dr. Ettling had analyzed it before the appearance of M. Piria's valuable paper on Salicyl.

This oil decomposes by keeping into two oils, one of which is specifically lighter, the other heavier than water. Dr. Ettling discovered that the latter possessed the same composition as hydrated benzoic acid.

The action of ammonia on the oil gives rise to some new interesting compounds. To obtain these compounds, it matters not whether saliculous or spiroilous acid he employed. The final product of the action of ammonia upon these, is the amide of salicyl (salicylamide). This body clearly belongs to the class of amides, for it does not evolve ammonia, on the addition either of potassa or of acids. The cause of its formation is as follows: three atoms of saliculous acid combine with three atoms of ammonia, and form saliculite of ammonia, whilst three of hydrogen and oxygen unite together and form water. This salicylamide combines with copper, iron, and lead, forming compounds.

* *Journal de Pharmacie*, Nov. 1840.

† *British Association*, Sept. 1840.

TURNER'S CHEMISTRY.

Elements of Chemistry, including the Actual State and Prevalent Doctrines of the Science. By the late EDWARD TURNER, M.D., F.R.S. L. and E. Seventh Edition. *Edited by* JUSTUS LIEBIG, M.D. Ph.D., F.R.S. L. and E., *Professor of Chemistry in the University of Giessen; and* WILLIAM GREGORY, M.D., F.R.S.E., *Professor of Chemistry, King's College, Aberdeen.* London: Taylor and Walton.

DR. TURNER'S Elements of Chemistry have long been known to our readers, who have, like ourselves, been frequently indebted to them for much valuable information. The work has passed through several editions, and has been favoured by a discerning public with a most extensive patronage, —a patronage to which its high merits most assuredly entitled it.

It is with much pleasure that we enter on the task of giving some brief notice of the seventh edition of this valuable work, on the appearance of which we may congratulate not only the student, but the more experienced Chemist, as affording a treatise to both, whose perspicuity, arrangement of subjects, clearness in the detail of experiments and elegance of style, entitle it to the highest rank as an elementary work on Chemistry.

The late sincerely lamented and amiable DR. TURNER intended to have perfected his work, with the valuable co-operation of Professor LIEBIG, who undertook the department of Organic Chemistry; but death, which deprived science of one of her brightest ornaments, prevented the carrying out of his intention. The task thus fell to the lot of DR. GREGORY, and we are glad that the preparation of the present edition for the press has been confided to such able hands. Greatly should we have regretted, if, from want of revision, and adaptation to the more recent advances of chemical science, since the lamented death of the author, this work —the monument of one of the most amiable, laborious and kind-hearted men that ever filled the Professor's chair—had been suffered to sink into oblivion. From our personal knowledge of the talents and worth of

the late Dr. Turner, we are able to attest the good fortune of University College in having selected such a Professor to fill the Chair of Chemistry on the opening of that distinguished seat of learning, nor have we less reason to congratulate them on the appointment of his worthy and talented successor, Mr. Graham.

The department of Inorganic Chemistry has been enriched by some important "recently ascertained facts." Dr. Gregory says in his Preface that "he felt that he could not hope to add any thing to the beauty and perspicuity of Dr. Turner's exposition of the doctrines of Chemistry, and particularly of combination in definite proportions, and of the atomic theory." Among the most interesting additions to this branch of chemistry, we may mention a chapter entitled, "*General Remarks on Salts,*" which afforded us much gratification in the perusal.

But it is in the department of Organic Chemistry that this work more particularly excels. All the experiments necessary for giving the great weight to this interesting branch of chemical science were made by the celebrated Professor Liebig.

The development which Organic Chemistry has recently taken — the many discoveries in, and additions to it which have been made during the last few years, — for some time have called for a work of this nature, into which they might be collected and embodied, and this deficiency, so long and so severely felt by men of science in this country, is thus amply supplied.

To enter into anything like a detail of the numerous excellencies with which this portion of the work abounds, would be impossible; we will therefore leave it to our readers to judge for themselves.

It is impossible to single out any subject which is not treated in the clearest and most satisfactory manner—a quality, which, although indispensable in a work of this kind, is not always met with. In every chapter or subject we find recorded all the discoveries made since the last edition, yet, with such care, and neatness of detail, that the volume, although abounding with every necessary information, is retained of a size that gives it an advantage over most others.

To the student in chemistry it is decidedly the best adapted of any manual in the English language. It is, indeed, a condensed epitome of the science. This is one of the greatest recommendations to those who wish to possess a work giving, in detail and consecutive connexion, the facts and doctrines of the science. Such is the work before us.

We earnestly hope that chemists and druggists will pay greater attention to chemical science. Their apprentices, also, should be allowed time for study, and should be made to do so; as, in case of a medical reform bill being passed, enacting that they shall undergo an examination, they will not be qualified to practise as chemists and druggists, even though they have duly served their apprenticeship, unless they are thoroughly conversant with chemistry, as well as other sciences, which they will be compelled to study. To these, the volume before us will indeed be an inestimable treasure.

For ourselves, we have often derived great advantage from the perusal of this work, and we are, therefore, enabled amply to attest its value to all lovers of chemical science.

ON THE EXTRICATION OF BARIUM, STRONTIUM AND CALCIUM.*

BY DR. HARE.

In this paper, Dr. Hare first calls attention to the following phenomenon observed by him almost twelve years since, and published. When the circuit in a galvanic battery, the deflagrator of the author, was completed through a saturated solution of chloride of calcium, the anode being formed by a coarse, and the cathode by a fine platinum wire, the latter was rapidly fused, while, when the situation of the wires was reversed, the ignition was comparatively feeble. It having occurred, some months since, to Dr. Hare, that this phenomenon might be due to the evolution and combustion of calcium at the cathode, he proceeded to apply a galvanic deflagrator of three hundred and fifty pairs of plates, in the process of Berzelius and Pontin, for preparing the amalgams of the metallic radicals of the earths. The author gives a sketch of the present state of our knowledge in relation to the metallic bases of the alkaline earths, as derived from the experiments of Davy; adding his own observations, in confirmation of the declaration of Davy, that the substances obtained by him from baryta and strontia, were amalgams of their metallic bases, and not the bases themselves; and, further, that the process employed for obtaining calcium, by Davy, was really incompetent to effect the desired result. He then proceeds to describe the peculiar apparatus by which amalgams of barium, strontium, and calcium were procured; the chlorides of the respective alkaline radicals being exposed to galvanic action, the cathode being mercury, and the anode a coil of platinum wire. The details of the apparatus cannot be properly understood without the figure which accompanied Dr. Hare's communication: its

* From *Silliman's Journal.*

chief peculiarities are the following: —

1st. It furnishes the means of keeping the mercury, forming the cathode, at a temperature nearly as low as 32° Fah.

2nd. It prevents exposure of the amalgam of the radical, to the direct action of the chlorine from the chloride used.

3rd. The alternate and successive, or the simultaneous action of two galvanic deflagrators, was conveniently obtained.

Dr. Hare states that after operating with a series of two hundred pairs of plates, of one hundred square inches each, for twenty minutes, unaided by these improvements, he had found the proportion of calcium to be but one six-hundredth part of amalgamated mass.

An apparatus for distilling the amalgam is also described and figured in Dr. Hare's memoir. It consists of an iron alembic, connected with a glass receiver, and an adopter communicating with a reservoir of hydrogen, and containing chloride of calcium and quick-lime. Within the alembic, an iron crucible, containing the amalgam, was placed, the crucible being closed by a capsule, in which was a portion of cautchoucine, and by its cover. Naphtha was poured into the alembic. The air from the apparatus was expelled by hydrogen, desiccated by passing through the chloride of calcium and quick-lime in the adopter. The distillation was conducted by applying heat principally to the upper part of the amalgam to prevent an explosive ebullition. The mercury being distilled off, which requires a bright red heat in expelling the last portions, the metallic radical remained in the crucible.

The metals oxidize rapidly in water; are brittle, fixed, and require a good red heat for fusion. They sink into sulphuric acid. By keeping in naphtha, they acquire a coating which renders them less active when exposed to water.

Dr. Hare attempted to separate from the amalgams when solidified by the use of solid carbonic acid, by straining them through leather; but the result did not answer his expectations.

By using solid carbonic acid and hydric (sulphuric) ether, Dr. Hare solidified a mass of the amalgam of ammonium. He considers that in this case a portion of ether combines with the alloy, without impairing its metallic character.

ON A NEW FAT ACID.

BY DR. PLAYFAIR.

Dr. Playfair had examined some of the vegetable fats, for the purpose of ascertaining whether the margaric acid contained in them possessed a constant composition. He remarked that the acid in the butter of nutmegs was peculiar, and had not formerly been examined. Pelouze and Bondet have stated in the *Annales de Chimie*, that it is margaric acid.

Dr. Playfair considered that the radicals of serecic and œnanthic acid were similar; in the former, however, one equivalent of hydrogen is replaced by one equivalent of oxygen. It is a beautiful white crystalline compound melting at 49 C. and is soluble both in alcohol and ether. The combination of the acid with oxide of glyceril, exists in the butter; it unites with metallic oxides and forms salts: these were described, but the results are not susceptible of analysis, as they were principally numerical.

The formula of the acid is $C_{28}H_{54}O_3$.

PROCESS FOR PREPARING HYDROBROMIC AND HYDRIODIC ACIDS.*

BY DR. R. W. GLOVER, OF NEWCASTLE.

Dr. Glover having observed that the solid bromide and iodide of barium are decomposed by sulpburic acid, with the evolution of hydrobromic and hydriodic acids, without bromine or iodine being set free, proposed the employment of these salts of barium as very convenient sources of the above-named hydracids in atomic proportions.

ON A PECULIAR CLASS OF VOLTAIC PHENOMENA.*

BY MR. STURGEON.

The author directed attention to some experiments published by himself in 1830, and to his theory respecting the electrochemical action of the simplest metals on acid and other solutions. He stated that the fact of iron not precipitating copper from its sulphate and other solutions, as recently observed by Prof. Schönbein, was one of the many beautiful phenomena discovered by Keir, and published in the Phil. Trans. for 1790.

ON THE RESIN OF SARCOCOLLA.

BY PROFESSOR JOHNSTON.

The resin of sarcocolla of commerce, may be separated by water into three portions: —I. A gum (A) which does not dissolve in

* *British Association*, Sept. 1840.

† *Ibid.*

water or alcohol, but which is chiefly washed out by means of the former solvent.

II. A portion (B) insoluble in water, but soluble in alcohol, which is of a resinous aspect, and is represented by $C_{40}H_{32}O_{14}$. The hydrate is $C_{40}H_{32}O_{14}+3HO$ when dried at 60°. This portion B, is separated (decomposed?) by bases into two or more organic compounds. The alcoholic solution gives with neutral acetate of lead a salt containing an organic constituent represented by $C_{40}H_{25}O_{16}$.

Ammonia throws down from the mixed solutions a second salt of lead, the constitution of the organic constituent in which has not yet been determined.

III. The portion soluble in water from the crude sarcocolla, when evaporated to dryness, may be separated by alcohol or ether into a soluble (C) and an insoluble portion (D).

IV. The soluble portion C dried at 212, gave results approaching to $C_{40}H_{32}O_{15}$, but when treated with bases, gave salts containing organic constituents of a different constitution. A neutral acetate of lead throws down a salt represented by $P6O+C_{40}H_{28}O_{15}$, and the subsequent addition of the neutral *tris*-acetate a salt represented by $2P6O+C_{40}H_{32}O_{16}$.

V. The portion D, soluble in water, but insoluble in alcohol, consists of a gum and of a substance which is precipitated by neutral acetate of lead in curdy flocks. The investigation is still in progress, and the results are to be considered as open to correction.

ON RESINS.*

BY PROFESSOR JOHNSTON.

Prof. J. in this paper, drew attention to following facts, apparently established by a table of analytical results, which he exhibited, and has had printed:—1. That the resins differ from each other in containing various proportions of oxygen. 2. That those in which the quantity of oxygen is the same, the hydrogen may vary, and this is another cause of difference in the properties of the resins. 3. That in all resins hitherto carefully analyzed, the number of atoms of carbon is constant. 4. That the resins, as a natural family, may be represented by a general formula containing two variables. 5. That the known resins divide themselves into two groups, possessing unlike chemical and physical properties. That of one of these groups, colophony may be considered as the type, and that it is represented by $C_{40}H_{32}+xOy$; that gamboge, or dragon's blood, may be considered as the type of the other group, which is represented by $C_{40}H_{24}+xOy$.

* *British Association*, Sept. 1840.

II. CHEMICAL MANUFACTURES.

PHOTOGENIC DYEING.

BY M. LAPOURAILLE.

A dyer, at Lyons, has for some years past been endeavouring to bring to perfection a mode of dyeing silks and cottons by solutions of metals alone, without the addition of any colouring matter. He found the solution of gold to be the best adapted for this purpose, and though he by this means contrived to produce a beautiful lilac and violet tints on the silks, they were not durable, and the expenses of such a mordant as a solution of gold induced him to discontinue his experiments. The plan he pursued was that of producing or deepening the tints to be obtained by exposure to the light, therefore it may be properly called a photogenic process. Though M. Lapouraille did not succeed to such an extent as he desired, he still conceives the plan capable of being carried into effect with great advantage; and for the purpose of directing attention to the process, and of assisting others who may wish to pursue the experiments, he has given the following account of those he instituted, with the results:—

In one third part of hydrochloric acid and two of nitric acid I dissolve fine gold. I pour some distilled water into a vessel. I add to it a few drops of the solution of gold, and then put in my silks. Whether the silk be dressed or undressed, the effect is always produced: but the colour is more beautiful in white silk that has been dressed. After the silk has remained ten minutes in the diluted solution of gold, I squeeze it, and put it to dry without washing. The colour that the silk has taken is a bright straw colour; no change is perceptible on the first day; and, in the shade, not any on the second; but when exposed to the sun the silk assumes various colours, alternating from red to yellow and lilac; and by this variation of colour forming changes of tints that disappear when removed from the sun. Unfortunately these tints are neither beautiful nor permanent beyond ten or twelve days at most. After this time the grey lilac, almost white, colour that the silk as-

sumes in the shade has only a slightly redder tinge when exposed to the sun, but the varying tints are lost. In order to obtain lilac as well as violet colour, the acid must be extracted from the silks that have gone through the solution of gold. They are then exposed to the sun, and in a shorter or longer time according to the power of the sun a very fine lilac is obtained; in summer one hour is long enough, but in winter it requires eight days, fifteen days, and sometimes even a month. In a camera obscura I have obtained very pretty tinges of lilac in ten minutes. To procure tints as deep as violet, it is requisite to put the silk already tinged with lilac again into the diluted solution of gold; the colour is not destroyed, it is rendered more bright. It is dried without being washed, the acid is afterwards extracted, and it is exposed to the sun; in a few hours the tint becomes twice as strong, and by repeating this process five or six times a beautiful violet colour is obtained.

On paper and on cotton lilacs are obtained in the same manner, but the colour is not so deep as it is upon silk. I have kept silks for three years dipped in a solution of gold. They had only a slight tinge of grey lilac, almost white, but after extracting the mordant and drying the silks in the sun, I have produced a very fine lilac twenty times deeper than it was before. All the lilac or violet colours which are obtained by the solution of gold, become red when exposed to the sun, to artificial light, or to a solution of alkalies; in the shade, or in contact with acids, they become blue; in the air they are unchangeable.—*Inventors' Advocate.*

IV. PHARMACY, &c.

THE STATE OF MERCURY IN THE UNGUENTUM AND PILULA HYDRARGYRI.

BY CHARLES WATT.

The state in which the mercury exists in "Unguentum and Pilula Hydrargyri" has long been a subject of perplexing speculation, both to physicians and to chemists; to the former, it has been a source of much dispute and discussion, whether the metal is in a state of minute division or protoxidation caused by the continued friction necessary for the formation of these compounds. To the latter, the process of preparing them has been equally a subject of difficulty, in as much as it is always very tedious and uncertain, seldom being finished under many hours, and more commonly as many days, completely tiring out those to whose lot the act of rubbing it unfortunately devolves; the trouble of which often induces the parties so engaged either to use surreptitious means of effecting the purpose, or to cast away a great portion of the mercury, and thus greatly to deteriorate the results.

Under the impression that the mercury in these preparations is in a state of protoxide, it has been suggested to form them by subjecting calomel to the action of ammonia; and, after repeatedly washing the precipitated protoxide, to mix it with the fats or conserve, according as one or other of these preparations is to be formed; but it is universally admitted, that when thus made, they are not found to equal in their operations those produced in the ordinary way; viz. by long trituration with fat or conserve.

It seems somewhat unaccountable, that chemists should not have made some analysis of these substances; at any rate none is to be met with in books. We find even such men as Dr. Duncan using very unscientific language respecting them. He considers that the facility afforded by the use of some old mercurial ointment in the process is, because the latter acts like a ferment. This, as will appear in the sequel, is absolute nonsense. Mr. Richard Phillips, in his translation of the Pharmacopœia, reprobates the use of oleum sulphuretum and turpentine, but gives no reason for his objections, nor suggests any substitute; he therefore adds but little to our stock of knowledge on the subject.

The numerous communications concerning, and processes for the "Killing of Mercury," as it is termed, we have of late received from all parts of the kingdom, have induced us to make many experiments, in order to set at rest the question as to "the minute division," or "protoxidation of mercury," in the preparations under consideration, and we are happy to be able to inform the readers of *The Chemist*, with perfect success. The results at which we have arrived will involve many considerations of great importance in medicine, utterly at variance with the commonly received opinions of the actions of the preparations of mercury upon animal bodies, in as much as they show, that finely divided mercury either rubbed on the surface or administered internally, will produce the same constitutional effects as the oxides, chlorides, or salts of that metal. It has always been held that, to produce its peculiar action on the body, it must be in the state of oxidation, or of combination with chlorine, which we shall subsequently shew to be erroneous.

Hitherto the most prevailing opinion of practitioners and chemists is, that the mercury is oxidated by the long friction it undergoes, in contact with the fat or conserve in the preparation of the ointment and blue pill: they will therefore be strangely surprised at being told, that in neither of these preparations is the mercury in the state of oxide, but that, on the contrary, it is in a state of extreme comminution, as will be made manifest by the following experiments, which were made with the greatest care, and with frequent repetition.

Having procured samples of mercurial ointment from parties distinguished alike for scientific knowledge, and undoubted probity, we divided each of them into four equal parts, and put each part into a glass vessel, which we subjected to the following operations.

Into one we introduced plain water, and placed the vessel over a lamp until it boiled for half an hour, when it was removed; the fat very soon floated entirely on the surface, and the mercury subsided to the bottom On pouring off the fat, while liquid, and also the water, and then adding fresh water to the precipitate and boiling it for a short time to free it from any adhering grease, the whole of the particles of mercury became collected into one brilliant mass.

The sample in the second vessel we subjected to the action of a sufficient quantity of weak alkaline ley to combine with the fat; after boiling for half an hour, we allowed the mercury entirely to subside, and then poured off the supernatant saponified liquid, added fresh water, and boiled it for a short time.

In this, as in the preceding case, the precipitate became united into a mass of metallic mercury.

In the third vessel, after melting the fat, we poured in two drachms of muriatic acid, with the intention of noting if any chloride of mercury would be formed, and therefore raised the heat and kept the contents of the vessel boiling for half an hour, and then removed the heat, and allowed the mercury to subside. When the fat and acid were quite clear, we poured them off into a phial and tested the liquid and the precipitate with lime water, caustic ammonia, and water impregnated with sulphuretted hydrogen, but without the slightest evidence that they contained mercury in combination with either oxygen or chlorine.

On adding fresh water to the precipitate, and boiling for some time, the particles of mercury, as before, became perfectly united.

Into the fourth vessel, after melting the fat and allowing the precipitate to settle as in the previous experiments, we removed the liquid fat and added about two drachms of nitric acid somewhat diluted to ascertain whether any binoxide of nitrogen would be liberated, as the formation of this gas would clearly indicate, that the mercury was in the metallic state, while its absence would of course show that the acid had acted on an oxide. So soon as the acid was poured upon the precipitate, the gas escaped in copious red fumes; hence the mercury must have been quite free from oxygen.

We have now shown, past all doubt, that mercurial ointment is a mere mechanical mixture of that metal and fatty matter—and not a chemical combination between them; and we may remark that our experiments are the more satisfactory, from the coincidence, that the weight of metallic mercury obtained by them, exactly corresponded with that prescribed in the formula of the London Pharmacopœia.

We may here state another result of our labours worthy of observation, i. e., the fatty matter was entirely changed into oleïc and steäric acids, modifications of oilybodies discovered by Chevreul.* It has been before remarked, that, when the ointment was merely melted over water, the mercury subsided, while the oily matter rose to the surface, this alone proves that the mercury could not be an oxide, for if it were, it would be in combination with the oleïc and stearic acids, a fact with which chemists are well acquainted.†

We have kept the mercury obtained during these experiments, and have noted the places whence they were procured, in order to be able to satisfy any doubts; which, however, may be perfectly dispelled by the repetition of the methods we have detailed.

With regard to the state of mercury in the blue pill, we may here remark, that it is precisely the same as in the ointment, viz. in that of minute division, and can be obtained by merely adding water, and boiling it till the mercury is collected into a mass at the bottom of the vessel.‡

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* See Chevreul's papers in the *Annales de Chimie et de Physique.*

† This circumstance is exceedingly peculiar, because, in order to form them in the ordinary way, long boiling in water with alkalies, earths or metallic oxides, is required, whereas here, on the contrary, they are found to be produced by trituration alone without the aid of any oxide, or even the contact of water.

‡ We may observe that the late distinguished surgeon, Mr. Abernethy, with his usual accuracy of observation, noted the difference of blue pill made at various places, and cautioned his pupils against using any not prepared with fidelity, and the best conserve, as when badly compounded, it proves irritating to the prima via; the

We cannot conclude without observing that where either the ointment or the blue pill is employed, it is evident that the same constitutional effects result, though the mercury is in the metallic state, as take place from the administration of any of the chemical combinations of that substance, and that therefore they do not depend on the presence of oxygen.

Our space will not at present allow of further details on this subject: we shall however resume it on some future occasion.

REMARKS ON THE HOMŒOPATHIC DOCTRINE OF HAHNEMANN.

BY MR. YOUNG.

When an allopathic* physician prescribes for his patient, he generally gives at least three or four compound medicines: so that, in an ordinary prescription, it is no uncommon thing to see a patient taking eight, ten, or twelve medicines, differing from each other in their effects on the human body; and these prescriptions are written with the idea that each medicine will perform its allotted part; for instance four medicines, which may happen to be called severally, diuretic, aperient, sudorific and expectorant, may, by chance, be combined in one prescription. Now, will any man in his senses be prepared to say that four such medicines, compounded and given to a person (either healthy or diseased), will produce each its attributed effect. Will such a medicine produce an increased secretion of urine, an increased secretion from the bowels, unusual perspiration and expectoration at one and the same time? I am inclined to think not; for even were it possible, the aperient would prevent the due action of the other three, by hurrying them through the alimentary canal.

To expect that those medicines, which when administered singly, produce certain deviations from the normal state, will, when combined with others of a different nature, produce each its separate effect, is the height of absurdity. Camphor and opium are often combined; and yet physicians are agreed as to their antidotal qualities. It is curious that it never entered their sagacious noddles that every medicine might have its antidote. That such is the case has been amply proved by Homœopathists: what therefore can be expected, but uncertain and unsatisfactory results from such random prescribing.

But this is not all. Certain medicines have peculiar effects attributed to them, but there is no existing proof that these medicaments do act in the manner described; a medicine tastes bitter, and it is set down as a tonic, yet how any medicine can give tone to the system I cannot conceive since no medicine possesses mere curative properties, but acts on the organism, by producing symptoms analogous to the disease they cure. "Certain general therapeutic qualities are attributed to particular substances. One is still, as it was said to be in the time of Dioscorides, 1700 years ago, a diuretic, another a sudorific; a third as an anodyne, a fourth an antispasmodic, and such, still is the description of them given in the pharmacological works of the present day. Hahnemann asserts, however, that in many instances they fail of producing the effects attributed to them."

But I am digressing in rather an unpardonable degree. The founder of Homœopathy, in the course of his experiments found that, to administer medicines with certainty and success, it was necessary they should be as pure as possible, and that they should be given singly and separately; that no food which acts medicinally should be allowed during their administration, and that the dose should not be repeated until the energy of the previous one was exhausted.* By this means the efficacy of a medicine was fairly tested; for in a mixture of ten or twelve medicines, how could the physician declare which was the one that removed the complaint?

It is a fact—and one worthy of notice—that medical practitioners in four-fifths of the diseases they treat, give purgative medicines. Morrison was only one-fifth worse, as he gave purgatives in every case. They called him a quack, and no doubt he was one; still he was only following the example set him by the most eminent of the faculty.

An Homœopathic physician never purges, bleeds, or blisters a patient, and yet cures disease in a prompt and safe manner: this advantageous method of cure is rendered

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reasons are now clearly manifested by our experiments, which demonstrate that the mercury, by being triturated with conserve which is acidified, becomes oxidated, and then acts too powerfully on the organs to be used as an alterative, and still less to be taken in large doses in cases of Syphylis.

* Allopathic—from *αλλον*, *different*, and *παθος*, *affection*; applied to substances which excite an affection different from that against which they are employed.

* How different this from the practice of the old school, who, when a medicine fails to effect a cure, increase the dose and lessen the period between them, as though they considered that if one drachm would not cure, twenty would.

available by observing the three following rules :—

1st. By giving every medicine singly and individually, taking care that nothing medicinal is taken to interfere with the due action of the medicament.

2nd. By choosing a medicine which causes the same symptoms, or symptoms most resembling those of which the patient complains.

3rd. By giving the medicine so chosen in doses sufficiently small, that no re-action shall ensue,* and by so preparing the medicine that its full virtues shall be apparent. Of the disadvantages likely to follow the indiscriminate mixing of medicines, I have already treated ; I have likewise pointed out the advantages gained by prescribing a medicine causing symptoms similar to those to be cured, and in a future article, I intend to produce proofs of the accuracy of this doctrine, but am now going to enter more immediately into the doses of the Homœopathists.

He who has been used to the ordinary doses of medicine—to the nauseous compounds generally administered to the sick —no doubt will think that the world is going wrong, or that people have lost their senses, when he is told that there are men who profess to cure disease with 1000th part of a grain of medicine ; and when such a dose is viewed in connection with our previous ideas concerning the powers of medicine, no doubt there seems something so ridiculous in the idea—something so repugnant to common sense—that we are led perhaps too hastily to form opinions hostile to the whole race of Homœopathists ; but I would beseech every lover of truth to examine before he condemns.

In the first place, the medicines of ordinary practice are hardly ever given pure ; in the next place, the diet of Homœopathy is such as to preclude the possibility of any interruption from substances which exert any medicinal action. All raw vegetable juices, all spices, all essences, odours or perfumes, all theiform infusions, and all that can by any possible means be supposed to exercise the slightest influence over the organism, are rigorously excluded. In the third place the principle which animates the body rises in rebellion against a violent attack ; thus, when a large dose is administered, nature is roused to reject the intruder immediately : hence abundant evacuations of all sorts, caused by the largeness of the dose ; while a minute dose is left to act on the organism slowly, gently, and undisturbedly, and thus to produce, without excitement, all that kindly influence which is soon cut short by a storm of reaction, in which all the individual and peculiar symptoms of the medicament are lost in inextricable confusion.*

The doses of homœopathy, moreover, are destined to act upon the part of the organism which is already affected : in other systems, they are given to produce symptoms in a different part of the body to that affected ; as, for instance, a purgative for headache, a diuretic in a case of anasarca, &c., &c. But there is a vast difference in these modes which does not appear at first sight. "A blow, for instance, which would inflict very little pain, if a sound part of the body were struck, would cause great agony if it fell on a festered finger. You may catch a cricket ball in a sound hand, while, when it is scalded or bruised, you can scarcely bear the gentlest air of a summer evening to come in contact with it. The eye, which when uninjured can steadfastly watch the lark half way up to heaven, when it is inflamed cannot bear the irritation of a chamber lamp." These facts speak for themselves ; they prove that the power possessed by a medicine is greatly increased by being directed against that part of the organism which is already affected.

But I have been arguing thus far as if medicines in homœopathic practice were prepared in the usual way, and as if the action of medicine were material—not dynamic. All medicines used by homœopathists undergo a long course of trituration and assimilation, generally in a glass mortar.† They are always kept in glass vessels and defended from the action of light. Will any one who has seen the power developed by rubbing a cylinder of glass with a piece of silk (which power will

* The following is Hahnemann's exposition of the reaction of medicines :— "Every agent that acts upon the human economy, every medicine produces, more or less, some notable change in the existing state of the vital powers, or creates a certain modification in the health of man, for a period of shorter or longer duration : this change is called the *primitive effect*. Although this is the joint effect of both a medicinal and a vital power, it belongs, notwithstanding, more particularly to the former, whose action is exercised upon the body. But our vital powers tend always to oppose their energy to this influence or impression. The effect that results from this, and which belongs to our conservative vital powers and their automatic force, bears the name of *secondary effect* or *re*-action.

* Everest's popular view of Homœopathy.

† In a future number the method will be given at length.

shake with agony the frame of the most powerful man) deny that a similar power may be communicated to medicine, by long trituration, or, at least, that a latent power may be developed? Thus much we do know, that medicines which are generally considered inert, such as chalk, silica, carbon, metallic gold, &c., by trituration acquire powers hitherto not ascribed to them, and it is indeed surprising that men of science never discovered this latent power, knowing as they did that mercury in its primitive state is inert, but that by mere trituration and minute division it becomes a powerful medicament,—it is surprising, I say, that this remarkable fact escaped their observation: but homœopathy has opened a new path in this department, and let us hope for better things.

Medical men have been so led away by the idea that the immediate cause of disease was material, that they have invariably until Hahnemann's time adopted, and do still adopt, the idea that the action of medicine is material: whether this is the case or not, the following case, which was published in the Lancet of Dec. 21, 1839, will perhaps exemplify:—

"X. Y., aged about 25 years, applied to me for relief, for a severe toothache. Upon examining his mouth, I found a small excavation in the crown of the second bicuspis of the upper jaw; the tooth bone was firm and healthy, the enamel only slightly injured, and the surrounding gum and mucous membrane unaffected. Under these circumstances, I advised the stopping of the cavity, with a view to save the tooth, an operation which I have performed with success in numerous instances. The preparation which I used upon this occasion, for that purpose is an amalgam of silver and mercury; the quantity introduced into the hollow of the tooth was six grains, of which one fourth was mercury.

"In twelve hours the amalgam had become firm, and the nerve, protected from the influence of the external air, had ceased to be painful.

"In twelve days from this time I was sent for to this man, and found him labouring under severe ptyalism; I removed the stopping from the tooth, and, upon inquiry, no other cause could be ascertained for this attack than the small proportion of mercury ($1\frac{1}{2}$ grs.) thus brought into contact with the salivary fluid. His constitution was good; he was a married man; had never suffered from disease of any kind, and had occasionally taken a blue pill as an aperient, without suffering any inconvenience."

Now this is a case which exemplifies a point which is of extreme importance in the administration of medicines; viz., that a much less quantity than is ordinarily given is sufficient to produce violent effects on the system: for in this case $1\frac{1}{2}$ grs. was the whole quantity of mercury contained in the tooth, and the stopping, we are told, was taken out, and no mention made of its diminution of bulk: it was still there, and it would, perhaps, have astonished the medical man had he weighed it, to have found no appreciable diminution of the weight of the mass: that such would have been the case I feel certain. Moreover, the power supplied to, or rather generated in, homœopathic medicines was (by the contact of the two metals) in this amalgam rendered feasible. But it thus is accounted for by the author of the article: "Under these circumstances, and from careful inquiry with regard to his preceding habits, aided by the opinion of the physician attending the patient, I have been obliged to come to the conclusion that this must be a case of peculiar idiosyncracy." No doubt! but if so, why did not the blue pills act in like manner? I know of but one reason, and that is a woman's—"because they did not" unless homœopathy is true.

The action of medicine is but little understood by the present race of medical men; but Hahnemann has set the example, and we may now hope that an uncertain art may be brought to deserve the name of a science, and that its results, when applied to the cure of disease, may be calculated with mathematical precision.

(*To be continued.*)

RESULTS OF EXPERIMENTS PERFORMED, WITH A VIEW OF DETERMINING WITH GREATER CERTAINTY THE DISTINGUISHING CHARACTERISTICS OF THE STAINS OF ARSENIC AS OBTAINED FROM MARSH'S APPARATUS.

BY P. H. HARPER, HENLEY-IN-ARDEN.

The theory of the action of Marsh's apparatus is so well known, as hardly to require mention. Hydrogen gas is formed in the midst of the solution suspected to contain arsenic: this gas has to be burnt on coming out of the apparatus, and the products of this combustion are to be examined. It is one of the properties of hydrogen to form with arsenic a compound called arseniuretted hydrogen, which burns like common gas, and leaves as a residue a sort of metallic soot; and if, after the gas is set on fire, a piece of glass, or a porcelain plate be presented to the flame, the combustion is thereby retarded, and a metallic ring is deposited

on the glass or plate. No other substances at present known yield metallic stains from this apparatus, except arsenic and antimony; therefore the first thing required is to distinguish between the stains obtained from these two substances. The stains obtained from arseuic on a porcelain plate, (which, by the way, I should always recommend as preferable to glass, as being liable to fewer objections and likewise more convenient), are round, of a bright grey shining metallic appearance, surrounded with a ring of white matter, gradually losing itself on the plate, while those obtained from antimony are of a dull white, of no particular form, and without any of the shining appearance of those of arsenic.

The stains obtained from arsenic are totally sublimed by heat. They are soluble in nitric acid at ordinary temperatures; and if a stick of nitrate of silver be applied to this solution, it forms a yellow precipitate which remains unaltered on the addition of pure ammonia. Again, if the stains be dissolved in nitric acid, which must then be diluted with distilled water, and saturated with pure potassa; and if ammoniacal nitrate of silver be added to this solution, it will produce its characteristic light yellow precipitate, becoming black on exposure to light. Also, if the ammoniacal sulphate of copper be allowed to digest for a few hours on one of the stains, it will produce the precipitate usually described as apple or grass green, but much more inclined to a dirty yellow green; while speaking of the ammoniacal sulphate of copper, I would beg leave to draw attention to the fact, that if a solution of nitric acid and water be saturated with carbonate of potassa and the ammoniacal sulphate of copper be poured upon them, it will produce a beautiful apple or grass green precipitate, which though very different from that obtained from arsenic when they are placed side by side, yet, from the description usually given, it might mislead: nitrate of potassa itself does not produce the same effect.

In addition to the above means, I would recommend the plan lately suggested by M. Lassaigne* viz. "To drive the gas disengaged from Marsh's apparatus through a solution of nitrate of silver; the arseniuretted hydrogen is gradually decomposed by the oxide of silver; the latter is then reduced, and metallic silver is deposited, arsenious acid being produced and remaining in solution with the excess of nitrate of silver employed. Hydrochloric acid is added to the solution which is then filtered and evaporated at a gentle heat in a porcelain capsule. During the concentration and evaporation, the nitric acid contained in the liquor acts on the arsenious acid, converting it into arsenic acid. This latter forms the residue of the evaporation, and it is then easy to ascertain the chemical properties." The stains obtained from antimony produce none of the above characteristics. From a quarter of a grain of arsenious acid, I have produced enough stains to perform the first experiments; and then to act upon the latter, and I likewise think, that if all of the above characteristics appear, we may be able to swear most positively, as to the presence of arsenic in any solution; and if it be animal matter which contains it, we may prepare it by nitric acid, &c. as recommended by Orfila, and then use the above mentioned means.

* See *The Chemist*, Vol. I. p. 347.

ON THE ADULTERATION OF DRUGS.

BY CHARLES WATT.

At various times we have had occasion to call the attention of our readers to the numerous frauds and adulterations practised in the chief articles of life, by those engaged in the respective businesses destined either to manufacture, or dispense them to the public. We have given detailed accounts of the adulterations of porter, bread, gin, &c.; it is now our lamentable duty to draw the attention of chemists, and indeed of the whole community, to a species of cruel and nefarious atrocity; and the task is more repulsive to us, as it affects that body to which our pages are more immediately addressed. We allude to the adulteration of drugs—a practice more infamous, sordid and cold-blooded, disgraces not the annals of crime, nor deserves greater severity of punishment. In matters of common concern to cheat any one, particularly the poor, is indeed base enough; but to deceive the sick and afflicted, and to defraud him of the fondly cherished hope of relief from the means intended for his restoration, is a turpitude which no language can denounce with due execration. No mind can but hold in abhorrence the wretch who is guilty of such villany. Who, that has visited the bed of sickness and approaching death, has not marked the eagerness—the restless anxiety with which the sufferer looks to, and inquires for the remedy which he hopes and believes will restore him to health and vigor! Quickly does he swallow the nauseous draught, and then in calm and tranquil resignation reposes on his gloomy couch awaiting the wished-for benefit. His hopes, alas! are soon defeated. Indeed, avarice has interposed its cloven foot in cases where medicine would have done good and dashed them from him.

Tempted by some trifling reduction in price, some parties are induced to stock their shops with inferior articles, or being in debt to the wholesale dealers, are obliged to take such as are sent. Hence is all concern for the goodness of the medicine, or the health of the patient, totally lost sight of and neglected.*

But what is still more frequent and more culpable from the rank of the individual, is the apothecary,† calculating more on the cost of renewing his stock, and laying aside his stale drugs, than on the good of the patient, compounds his medicines and prescriptions with drugs, which long since ought to have been burned or cast to the winds. We here speak of a practice too common to admit denial. It has come to our knowledge from authority the most undoubted, that in London, Birmingham, Bristol, Liverpool, and other large towns, it is only at a very few of the first-rate houses, that drugs of really genuine quality can be obtained.

It is our intention to examine those from different houses, and from time to time to give accounts of our results.

In former numbers of the Chemist, we have, recommended the establishment of a Board of Commissioners, with power to regulate the Drug Trade, and to punish such as break the law by the employment and disposal of bad articles. We are forming means of testing the various substances appertaining to Pharmacy, and are not without well-grounded hope of being able to detect any impurity or bad quality in them. It is our intention to keep samples of genuine articles, and to examine and compare any sent to us, and report their quality.

Before concluding, we may mention a few of the frauds and the means by which they are accomplished; for instance, the adulteration of jalap is with a damaged kind of linseed meal, &c. Epsom salts are mixed with glauber salts peculiarly crystallized, and sold at low shops, *ticketed* for a half-penny per ounce. Sulphate of quinine is much sophisticated: it is mixed with cheaper bitters, and even with magnesia. Balsam of copaiba is mixed with castor oil, and even turpentine. To get the essential oils in a pure and genuine state is next to impossible: only let any one try, by promiscuously purchasing them at any two shops, and the truth will soon be made manifest.

As we shall have but too often, we fear, to recur to closer and more minute details on this subject, we must leave any further particulars for the present; but we cannot do so without hoping, and earnestly invoking the due consideration of the subject by Parliament in the approaching Session, and that Mr. Hawes, (to whose industry and adaptation for business the community is already under heavy debts of gratitude for many valuable amendments in the laws), will introduce into his Medical Reform Bill, clauses to compel the examination of druggists as to their qualifications, and to establish a suitable Board of Commissioners qualified to test the purity of drugs, and with power to punish any infractions of the law with adequate fines, suspension, or other penalty. Great, indeed, would be the benefit to the public from such an enactment as we have suggested, redounding incomparably more to the honour and credit of Parliament and Ministers, than raising by despotic force an enormous revenue from the vices of the people.

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* Our eye is on these parties, and whenever we detect any fraud committed or sanctioned by them, we shall not fail to give it in detail. Our object is to protect the public and fair dealers—others must be on their guard.

† The long time which certain articles are kept by this class, often causes them to become quite inert: we have frequently seen instances in which, from penury or neglect, medicines have been totally spoiled.

MEDICAL REFORM. — ADULTERATION OF DRUGS. — MR. HAWES' BILL.

Gentlemen,—With many others I am gratified to think, that in "The Chemist," we have a publication devoted to the true interests of our trade, the pages of which are open to the contributions of its subscribers, to express their opinions and their wants; to a statement of the evils which environ them, and for which they and you are seeking a remedy.

From the generally acknowledged fact that Mr. Hawes's Medical Reform Bill is the bill of the Profession—the one which they will support in opposition to that of Mr. Warburton—but little doubt exists that this is the bill which we are to have, (if we have any,) modified by those circumstances which party or individual interest never fails to produce.

Now, in many of the medical profession there exists a strong feeling of dislike and distrust to chemists and druggists. A part of this may result from the "counter practice" of the latter, or from so many of them "quacking" in some way or other; and so, trenching on the peculiar duties and profits of the profession, make its members view this irregular practice as an evil which ought to be put down. But the jealousy

and rivalry existing between the practitioner and the druggist will ever, without a separation of their distinct callings, marked by some legislative act, prevent their co-operation.

After giving, in your Decemher numher, an abstract of Mr. Hawes's Bill, you alluded to the necessity of an inspection of druggists' shops, and suggested that clauses embracing this feature, should be added to it. But the whole system of the trade is so corrupt, that I am satisfied nothing but a *parliamentary inquiry into the state of the wholesale and retail drug trade*, including in that, the adulteration of drugs, the irregular practice of druggists, the per centage system, and quackery, will ever induce the legislature to adopt, in any "Reform of the Medical Profession," those stringent measures which the present degraded state of the drug-trade imperatively calls for.

This, then, appears to me to he the first thing for which the chemists and druggists should petition. Whatever measures affecting them appear in Mr. Hawes's bill, must have originated from evidence adduced hy members of the medical profession alone, and not from themselves. Why the physicians, surgeons, and apothecaries, should have heen examined (in the Parliamentary Inquiry of 1834) relative to their several callings, and not the chemist and druggist, is an anomaly that I cannot account for. Now is the time to remedy this. Meetings should he called in every town—petitions to parliament prepared—a central committee appointed in London—and, if necessary, a parliamentary agent engaged to watch the progress of this, or any other hill which may affect their interests.

To the trade generally, the extent of adulteration in drugs may not be known, but enough is certainly known to justify them in petitioning for a thorough system of inspection from the IMPORTER down to the DISPENSER. In what hody to vest this right of search must he a subject for careful consideration. No government favouritism—no family interest—no poor relation unprovided for—should he allowed to interfere in the selection of individuals for so responsible an office. I might, if it were necessary, point out some curious instances of the ignorance of government officials in connexion with the drug trade. Not many years ago spirits of nitre, aromatic spirits of ammonia, and æther, were manufactured in Scotland and in the Channel Islands, and sent into the London and other markets at much lower prices than they, in consequence of the high duty on spirits, could he made in England. But no one for a moment imagined that any spirit lay concealed in these articles, until one or two manufacturers of them, feeling so shocked at his Majesty's revenue heing defrauded in this way, (and their own trade falling off in the same proportion,) gave notice to the Board of Excise. Even at this present time it is strongly suspected that some of the naphtha which finds its way into the English market from Scotland, Ireland, and elsewhere, is made to order from the same material. The duty of inspection must, for ohvious reasons then, he vested in individuals of character and integrity, who are well acquainted with drugs and chemicals; and, who are also capable of testing and analysing them. To satisfy all parties, the inspector should undergo a rigid examination by a competent authority hefore heing appointed.

This system of inspection is one thing which Mr. Hawes's Bill does not provide for; it is a thing essential, equally to the well-being of the drug trade, and the medical profession. Provision for this, for the immediate and unconditional extinction of quackery, and for the examination and licensing of chemists and druggists, appear to me ahsolutely necessary in any measure which the legislature may have in contemplation.

I have presupposed in my remarks, that, in our trade, at least, the old maxim of "Honesty is the best policy" is not entirely forgotten. If there be any who would prefer living a life of meanness and degradation, wanting only the act of publicity to call forth the blush of shame, or the righteous judgment of the law; by such this reformation will be viewed with distrust and hatred: hut hy the honest and upright it will he anticipated with pleasure, as a means of placing him on an equality with his dishonest and rapacious neighbour; and who will have the additional satisfaction of knowing, that his occupation in business does not degrade his character as a man.

Wishing you, Gentlemen, in the second and succeeding years, that success which your exertions, and the character of your publication deserve,

I remain,
Your humble Servant,
A DRUGGIST.

Dec. 7th, 1840.

[We entirely agree with "A DRUGGIST" as to the necessity of the system of inspection which he proposes, and the assistance of our advocacy shall not he wanting in so righteous a cause. All our influence shall be used towards the attainment of the various objects which we consider of importance to the welfare of chemists and druggists. We hope that something will he done in the ensuing session of parliament.

We also agree with our correspondent as to the propriety of meetings heing called, and of the formation of a central committee; and we advise the trade to adopt these mea-

sures. Our assistance will ever be afforded towards the furtherance of their objects.]

LATE HOURS AND SUNDAY TRADING.

Plymouth, November 30th, 1840.

To the Editors of the Chemist.

Gentlemen,

The opportunities which your useful work affords to druggists, of making public their grievances, and of offering any suggestions, that may tend to ameliorate the condition of their fellow tradesmen, have induced me, (knowing your willingness to promote the welfare, and to maintain the rights of that body), to call your attention to the benefits that would accrue to druggists and their assistants from closing business at an earlier hour. To those who are actively employed in a shop from 7 A.M. till 11 P.M. fatigued and harassed as they must naturally be, what pleasure can there be in taking up even a light work to read, much less then to pore over the pages of such dry subjects as chemistry, anatomy, geology, &c., which cannot animate the weary mind to improvement, because they do not combine amusement with instruction, and not being sufficiently attractive, are calculated to produce in the minds of young persons rather a distaste for such studies, than an incitement to excel.

Druggists ought to be a well instructed class, perfectly conversant with every branch of their trade, and well informed on most other subjects; but if they have to toil incessantly in business, what time can they have for study or recreation, or what time to enjoy the peaceful comforts of a domestic circle? Even devotion yields to business; there are few druggists I think who open their bibles above once a week, many not so frequently, and even when they do, they are so liable to be interrupted, that they can feel very little interest in what they are reading; many a youth would gladly sit down to his bible for half an hour of a day, but in the present state of affairs such a thing is impossible; business is the *summum bonum* with all, and must be attended to, even to the neglect of other duties, equally, if not more, important.

But to whom, let me ask, is the fault of such want of leisure to be attributed? To the Public?—No.—To whom then can it be attributed but to the druggists themselves? There exists such a jealousy among them—such a want of confidence in each other—that no one dares to set the example by closing his shop, fearing that the others will not comply, and that he may thereby lose customers; the reform must begin with themselves, the public they may be assured, will never make the slightest endeavour to lessen their labour; why should they? but on the contrary, while they find that they can get their medicines as well at 10 o'clock as they can at 8, they will never put themselves to the least inconvenience by applying earlier.

Let the druggists therefore unanimously follow the example set them by the bankers, and close their businesses at an earlier hour, and the public must conform; they will then have a time for study and recreation, a time for devotion; a time for all things; the better disposed of their assistants will apply themselves to the study of such subjects as it is requisite for them to be acquainted with; they will attend lectures and other places of instruction and improvement, and the druggists will soon become not only a more intelligent and respectable, but a happier class of society.

With many hopes that this may attract the attention of those who may be influential in bringing about a change, and that the suggestion that I have ventured to make may be acted upon so as to procure a little leisure for those to whom it would be beneficial,

I remain,
Gentlemen,
Your most obedient servant,
F. B. B.

ON OPACITY OF THE CORNEA PRODUCED BY SULPHURIC ACID.*

BY R. D. THOMSON, M.D.

The rapid destruction of sight, consequent on sulphuric acid being brought in contact with the cornea, has long been well known to surgeons. But Dr. Thomson was not aware of any accurate investigation of the cause having been entered into. The subject came under his consideration from having attended a case with Dr. Maddock, in which the vision of the right eye was destroyed, in consequence of a woman having, in a fit of passion, thrown a quantity of oil of vitriol at a man. According to the sufferer, the corrosive fluid was in contact with his eye only about two minutes, when he had an opportunity of washing it off with water. Yet permanent opacity of the cornea had taken place. It naturally occurred, from a consideration of this statement, that the agency of the acid could not have extended to any very considerable depth. The anatomical structure of the cornea likewise favoured

* Medical Section of the British Association. From *The Athenæum.*

this conclusion. This important part of the eye is constituted of laminæ of transparent albuminous membrane, each of which is separated by a stratum of fluid matter. These laminæ can be readily separated by the point of a knife. But in addition to these laminæ, the conjunctiva covers the whole of the anterior surface of the cornea, so that this latter membrane may be considered as the external lamina. During health the cornea is perfectly transparent: but when any cause comes into operation which prevents the free secretion and absorption of these fluids, probably from the abstraction of the aqueous portion and the greater condensation of the albumen held in solution, it happens that the cornea becomes dull and somewhat opalescent, and that peculiar appearance is produced, so familiar to the physician in the eyes of his patients. When heat is applied in the proximity of the dead cornea of the sheep, the dulness of the cornea immediately becomes apparent, a phenomenon which is to be explained by its action upon the albumen. Even without the application, however, of any external agent, the dead cornea has a glazed aspect, which is to be attributed to the action of the absorbents after death, and the consequent abstraction of the more fluid portions. When nitrate of silver, in a moistened state, is brought into close and extensive contact with the cornea, a white curdy appearance takes place, which is, in the first instance, produced by the decomposition of the common salt contained in the fluid which lubricates the eye. The secondary action is to form chemical compounds with the conjunctiva, and if the quantity of nitrate is sufficient, to extend the destructive agency to the various laminæ of the cornea. The nature of those compounds was described in a previous communication to this section at Newcastle. When sulphuric acid, or common oil of vitroil, which is a very impure substance, is brought into contact with the dead cornea of the sheep, in three or four seconds, if the experiment be watched under the microscope, the acid, which appears to swim about freely on the surface of the cornea, produces a milkiness; in half a minute, a white opacity; and in from one and a half to two minutes all translucency is destroyed. If the cornea, which has been previously extended on glass, be now plunged into water, and washed free from sulphuric acid, a permanent opacity will be found to have taken place precisely as in the case of those unfortunate individuals who have been deprived of vision by sulphuric acid in the manner already described. If we now make a section of the cornea which has been acted on by the acid, we shall find that the action has been very superficial, and that the upper and under surface of the opaque portion are parallel —and hence the influence of the acid would appear to have extended equally. If the section be now made at right angles to the axis of the eye, so as to separate the opaque from the uninjured portion, the transparency of the cornea appears to be perfectly restored, and the only defect, when a careful examination is made by the microscope, appears to proceed from the uneven surface produced by the section. But the opaque portion may likewise be readily separated, by scraping it with the point of a knife—so decided is the limit between the uninjured and opaque surfaces. It would appear from these facts, that the action of the sulphuric acid is to produce a new or false membrane, which is not removed by nature, as some other false membranes are, in consequence of its forming part of a solid body; they serve also to confirm the opinion stated by the author in a communication read at the Bristol meeting—that false membranes, as in croup, balanites, bronchitis, &c., are the consequences of the presence of an acid preternaturally secreted in the fluids of the mucous membranes where these deposits occur—the organization of the albumen taking place under the coagulating influence of the acid. The treatment of opacity of the cornea produced by the action of sulphuric acid appears to be elucidated in no small degree by these facts;—if the acid be neutralized in the course of a few seconds, little or no injury is sustained by the cornea; but as in thirty seconds considerable opacity has occurred, and some portion of false membrane has been formed, it will be necessary to have recourse to the knife, which may be safely employed to scrape off the preternatural deposit. The author observed, that he intended to propose the operation to the patient described, so soon as the granulating action now affecting the eyelids had been subdued.

ON CERTAIN FERRUGINOUS PREPARATIONS.

BY M. BERAL.

A work undertaken with the view of rendering the preparations of iron used in medicines still more perfect, has led me to the discovery of many ferruginous preparations not yet studied, or but little known. I will describe the most striking properties of these products, while I am completing that which I have already published concerning these compounds in general, and more particularly as regards the citrate of iron. I may seize this opportunity for communicating the formulæ for several medicines—which are beginning to be much used, and which formulæ have not been published in any work.

CITRATE OF PEROXIDE OF IRON.

Citrate of peroxide of iron is obtained under the form of transparent bracteæ of a fine garnet colour. This very remarkable salt may be dissolved in water with the greatest ease: its solution is stable and its taste is not very strong. It is the basis of many pharmaceutical compositions, on which I shall treat in a future article.

CITRATE OF PROTOXIDE OF IRON.

This salt is prepared by treating iron filings with citric acid previously dissolved in distilled water. It is white, pulverulent and not very soluble. The action of light quickly colours it, and damp air modifies its constitution, making it pass to a different degree of oxidation. Like the other salts of the protoxide of iron, it has a very atramentary taste.

CITRATE OF OXIDE OF MAGNETIC IRON.

Combined with citric acid, oxide of magnetic iron, yields an uncrystallizable salt, of a green colour, and susceptible of forming transparent bracteæ. This salt is soluble and very active, but it has a very powerful atramentary taste. It is a remarkable fact, that its solution undergoes no alteration, but retains its green colour, even when exposed for a length of time to the action of atmospheric air.

CITRATE OF IRON AND QUININE.

Citrate of iron and quinine is a new salt, much wanted in therapeutics. This medicine is formed by combining four parts of citrate of iron with one of quinine. It is obtained under the form of transparent bracteæ, soluble, very bitter, and of a garnet colour.

Owing to its great bitterness, it can be conveniently administered only in the form of pills.

FERRUGINOUS WINE OF QUINQUINA.

Composed of elements supposed to be incompatible, the ferruginous wine of quinquina constitutes a new medicine, the want of which has constantly been felt, and which, in the hands of physicians, will be the subject of many useful applications.

Fifty parts of this wine contain one part of citrate of iron, and the soluble principles of three parts of quinquina. The quantity of citrate may be increased at pleasure.

TANNATE OF PEROXIDE OF IRON.

This salt is obtained by adding tincture of gall to a solution of a peroxidised salt of iron. It is blue, insoluble and tasteless. Its properties are not very remarkable.

SYRUP OF TANNATE OF IRON.

R.	Simple syrup . .	375 gram.
	Syrup of raspberry vinegar	125
	Citrate of oxide of magnetic iron . . .	10
	Extract of nutgalls . .	4

Prepare *secundum artem*.

Many physicians use the tannate of iron in the form of syrup. As the iron, in this preparation, is in the state of ferro-tannate of the protoxide, and associated with an acid, it is soluble, sapid, and susceptible of many useful applications.

SYRUP OF IODIDE OF IRON.

R.	Simple syrup . .	200 gram.
	Liquid iodide of iron .	1

M.

Every tea-spoonful of this syrup contains one gramme, or five centigrammes, of dry iodide.

As soon as a solution of iodide of iron is put in contact with atmospheric air, one part of the iron is oxidised, and a corresponding quantity of iodine is liberated. This circumstance, unfortunately, modifies the action of the medicine, and very much prejudices its use.

Water saturated with sugar possesses the power of resisting the oxidation of iron. Therefore, it is only under the form of syrup that it can be administered.

SACCHARATE OF LIME.

Simple syrup . .	1000 gram.
Quick lime . .	10
Water . . .	100

Slake the lime with the quantity of water prescribed; add the mixture to the syrup; boil for ten minutes, and filter. Add to the product four times its weight of simple syrup.

Professor Trousseau was the first to whom the idea of using this medicine occurred, and experience has shown him that it would be inconvenient to use this syrup at a higher degree of concentration. It is used in chronic and obstinate diarrhœa.

LACTATE OF IRON.

The following is the process which I have found most successful:—

500 grammes of lactate of lime are dissolved in 2 kilogrammes of boiling water; the lime is precipitated by means of oxalic acid, which forms an insoluble oxalate, and it is filtered. The liquid obtained contains lactic acid, which, put in contact with iron filings, and heated for six or eight hours, yields, on cooling, very white lactate of iron, in a crystalline powder; nothing remains to be done, beyond separating it from

the excess of iron, washing it with alcohol and drying it.

By treating peroxide of iron with lactic acid, I have obtained a red, soluble lactate of iron; but I have not yet studied it sufficiently to enable me describe its characters.

MARSH'S APPARATUS FOR DETECTING ARSENIC.*

The recent trial of Madame Laffarge at Tulle, for the murder of her husband by administering arsenic, has given rise to much angry discussion among the French chemists, owing to the different results arrived at by those employed to analyse the decomposed remains of the deceased. M. Raspail denies the correctness of the experiments made by M. Orfila, who detected arsenic in every part of the putrid mass submitted to experiment. It seems, indeed, admitted that the delicacy of the test for arsenic afforded by Marsh's process is liable to cause dangerous inferences from its power of detecting the most minute particles of the poison; and as it is now found that the human body always contains a minute portion of arsenic, the effect of any analysis so refined may induce the belief that the cause of death is the poison inherent in the human frame. These discoveries and discussions have caused attention to be more directed towards Marsh's apparatus, and suggestions to be made for the improvement of it.

The process itself consists essentially in making hydrogen gas, in the ordinary gas apparatus, from the solution suspected to contain arsenic. If arsenic really exists in the liquid, it will combine with the hydrogen produced, so as to form arsenuretted hydrogen gas. This gas is burned as it issues from a tube fitted to the vessel in which it is produced, and by receiving this flame on earthenware plates, small quantities of arsenic are collected, spread over the surface in bright metallic spots, the nature of which can be determined by the usual tests; that is, by nitric acid, which converts metallic arsenic into arsenic acid; then with the nitrate of silver, which forms with it an arseniate of silver, of red brick colour.

This process is simple, but it is attended with several inconveniences. If the gas be inflamed too soon there is the risk of detonation, and the vessel will be broken to pieces. A large quantity of the arsenurretted hydrogen is lost at the same time. If the ignition be deferred, so as to avoid the risk of explosion, a portion of the arsenic may escape. In short, it becomes difficult to perform the operation so as to obtain the arsenical spots, notwithstanding the presence in the liquid of even a large quantity of arsenic; though the process will detect the most minute quantities, if rightly managed. Those who have performed the experiments know that the angle at which the plate is held to receive the flame, and the size of the flame itself cause the results to vary, and nothing certain has been fixed, either as regards the degree of inclination or the size of the flame. To remove these causes of error, M. Lassaigne proposed to make the gas pass though a solution of pure nitrate of silver. The arsenuretted hydrogen gas mixed with the hydrogen is then decomposed by degrees by the nitrate. The silver is precipitated in black flakes. There is produced arsenious acid mixed with the excess of nitrate of silver. This excess of nitrate of silver is decomposed by chloriodic acid; it is thus converted into a chloride; it is filtered, and the chloride and the metallic silver are separated from it. The filtered liquor is heated; the nitric acid which it contains re-acts on the arsenious acid, and converts it into arsenic acid; the properties of which are ascertained by the ordinary means. M. Lassaigne is of opinion that this process would detect one milligramme of arsenious acid dissolved in a thousand grammes of water; that is, in the proportion of one-millionth part, or of about one grain of arsenious acid in 18 gallons of water.

Some objections have been raised against the process of analysis by Marsh's apparatus; one of which is founded on the multiplicity of the operations necessary to discover such small quantities of arsenic. But the strongest objection, if well founded, proceeds from M. Raspail, who asserts that the nitrate of silver is as uncertain a test of arsenic as sulphuretted hydrogen, and that the red brick colour may be obtained by means of that nitrate on other metallic spots produced by Marsh's process, which have all the appearance of arsenic, though they contain not an atom of that metal. The acetate of iron, mixed with a phosphate, especially with an iodide, will, according to M. Raspail, produce these false appearances of arsenic. Besides, he affirms that the red colour is of so many different shades that it can only mislead.

M. Raspail, after having endeavoured to detract from the value of nitrate of silver as a test of arsenic, proceeds to examine the process of M. Lassaigne, which he thinks equally fallible with the other. But in order to show the uncertainty of Marsh's apparatus, it must be proved that any other metallic spots produced thereby, besides arsenic, can be volatilised at a low degree of

* From the *Inventor's Advocate and Journal of Industry.*

heat, easily dissolved in nitric acid, and are coloured red by nitrate of silver. This M. Raspail has failed to do.

The doubt, however, which exists respecting the application of the process in the trial of Madame Laffarge does not depend on the nature of the metallic spots, but merely as to the source whence such small quantities of arsenic as were found came. With a view to establish more satisfactorily the results of the analysis made at Tulle, M. Orfila has been instituting fresh experiments in Paris before a commission appointed by the Academy of Medicine, for the purpose of showing the action of arsenic on the body of animals, and the mode of detecting it after death. Two dogs were killed, one by arsenic and the other by hanging. On examining their bodies twenty-four hours after death, the urine of the poisoned dog exhibited manifest indications of arsenic by Marsh's apparatus, whilst that of the other dog exhibited no trace of it. Portions of the liver of the two dogs were submitted to the test of Marsh's apparatus, with similar results; in the liver of the one which was hanged no arsenic was detected, whilst the liver of the poisoned animal gave decided evidence of its presence. M. Orfila has determined in the course of his experiments, that arsenic when taken in quantities not sufficient to produce death is quickly carried from the system by the urine, and therefore he concludes that it is indispensable in the treatment of persons who have taken arsenic to favour the secretion of urine as much as possible.

ON POISONS, CONTAGIONS, AND MIASMS.*

BY PROFESSOR LIEBIG.

At the meeting of the British Association, Dr. Playfair said, that at the request of the author, he had prepared a statement of Prof. Liebig's new views on the subject of poisons.

Poisons may be divided into two classes, those belonging to the inorganic and organic kingdoms. Many substances were called inorganic poisons which had in reality no claim to be considered as such. Sulphuric, nitric, and muriatic acid, when brought into contact with the animal economy, merely destroyed the continuity of the organs, and might be compared, in their *modus operandi*, to the action of a heated iron, or a sharp knife. But there are others—and these are the true inorganic poisons—which entered into combination with the substance of the organs without effecting any visible lesion of them. Thus it is known, that when arsenious acid or corrosive sublimate is added to a solution of muscular fibre, cellular tissue, or fibrin, these enter into combination with them, and become insoluble; when they are introduced into the animal organism, the same circumstance must happen. But the bodies formed by the union of such poisons with animal substances are incapable of putrefaction; they are incapable, therefore, of effecting and suffering changes; in other words, organic life is destroyed. The high atomic weight of animal substances explains the cause of such small quantities being requisite for producing deadly effects. After stating several chemical details on this subject, it was shown that to unite with 100 grains of fibrin, as it exists in the human body, (in which it is combined with 30,000 parts of water) only $3\frac{1}{2}$ grains of arsenious acid are necessary, or 5 grains of corrosive sublimate. The second class of poisons were those belonging to the organic kingdom. For some such substances as brucia and strychnia, no data exist by which it can be determined to what cause their action may be assigned. But the morbid poisons, such as putrid animal and contagious matter, appear to owe their action to a peculiar agent, which exerts a much more general and powerful action than chemists are aware of. Thus, when oxide of silver is thrown into peroxide of hydrogen, the oxide is reduced, and metallic silver remains. Here there can be no affinity, for oxygen can have no affinity for oxygen. It is merely that a body in a state of motion or decomposition is capable of inducing upon or imparting its own state of motion or decomposition to any body with which it may be in contact. There is a disease frequently produced in Germany by using decayed sausages as an article of food. The symptoms attending the disease are remarkable, and distinctly indicate its cause. The patient afflicted with the disease becomes much emaciated, dries to a complete mummy, and finally dies. The muscular fibre and all parts similarly composed disappear. The cause of this evidently is, that the state of decomposition, in which the component parts of the sausages are, is communicated to the constituents of the blood, and this state not being subdued by the vital principle, the disease proceeds until death ensues. It is remarkable that the carcases of the individuals, who have died in consequence of it, are not subject to putrefaction. The cause of the action of contagious matter is similar. It is merely a gaseous matter in the state of transformation, and capable of imparting the state of transposition, in which its atoms are, to the

* *British Association;* From *The Athenæum.*

elements of the blood. It is capable of being reproduced in the blood just as yeast causes its own reproduction in fermenting *wort*. The causes of the action of yeast and of contagion were shown to be the same, and examples were produced in which similar reproductions take place in common chemical processes. There are two kinds of yeast used in the brewing of Bavarian beer. The fermentation caused by one is tumultuous; that produced by the other is tranquil. They, therefore, induce the peculiar state of transposition in which their atoms are upon the elements of the sugar. The same was shown to be the case with the vaccine virus of cow and human small-pox, of which, one produces a violent action upon the constituents of the blood, whilst the other causes a gentle action quite distinct from the former.

Prof. Hannay said he could not exactly coincide with the views proposed regarding the action of inorganic poisons, as he was convinced the cause of their virulence was owing to something further than mere combination with the animal membranes; nor could he coincide in the comparison brought forward by Dr. Playfair, that sulphuric and oxalic acids merely acted like a heated iron, by destroying the continuity of particular organs. He thought that through the course of the inquiry chemistry had been too much kept in view, and that medicine had not been sufficiently consulted. It was singular to see us brought back to the time of Hippocrates, who also had affirmed that contagious matter was a kind of yeast acting in the blood.—Dr. Playfair explained that Prof. Liebig expressly states in his report, that this subject cannot be completed without the co-operation of physiologists; that he had therefore merely brought forward the purely chemical part of the inquiry, and hoped thereby to draw the attention of physiologists to its further investigation. Hippocrates had certainly compared the action of yeast with that of contagious matter, and the comparison was so apt that it could scarcely be avoided; but the merit of Liebig's views is, that he has explained the action of yeast, and shown that it is owing to a peculiar agent which has hitherto escaped attention, but which plays a very important part in the phenomena of combination and decomposition.

AMMONIO-TARTRATE OF IRON.

Dartford, Dec. 6, 1840.

To the Editors of the Chemist.

Gentlemen:

I wish to call the attention of the Medical Profession to a new preparation of iron, but little known, and I believe little used by that body of men, viz., the *Ammonio-tartrate of Iron*, made by Mr. Morson, from the formula of Aikins, a copy of which may be seen in Pereira's Materia Medica; it contains a larger proportion of iron than the sulphate of the same base, and may be given in either powder, pills, or solution, and is not readily decomposed, except by the fixed alkalies; it may be given in beer or porter without discovering the taste.

The above is a short description of this excellent preparation, which I hope will not intrude on your valuable pages.

I remain, Gentlemen,

A constant reader,

Medicus.

NEW MEDICAL TREATMENT IN GERMANY.*

At a recent meeting of the Westminster Medical Society, Dr. J. Johnson called the attention of the meeting to a new mode of treating disease, which has lately come into vogue in Germany. This is called hydrosudopathy, and it consists in subjecting the patient to the external action of hot and cold water alternately, accompanied by copious draughts of the latter. The patient is first wrapped in blankets, and made to perspire plentifully. He is then plunged into a cold bath, and having remained in it a short time, is taken out, and made to walk about quickly, till he gets warm again. He drinks cold water while in this state, and some persons have been known to swallow the enormous quantity of four or five gallons. He is then put into bed, and a second perspiration takes place. If it should be difficult to bring on perspiration again, the object is found to be speedily attained by wetting the blankets before the patient is wrapped in them. This method is used in all complaints, even in cases of violent pneumonia. Dr. Johnson did not seem to have a very high opinion of its efficacy; he stated that he had conversed with many German physicians on the subject, and the result he arrived at was, that it was not attended with disastrous consequences which at first sight might be expected from it. He illustrated the matter by the Russian custom of rolling in snow immediately after quitting the vapor bath, which he had himself witnessed.

The method of hydrosudopathy was invented by a Bohemian peasant, named Presnitz. Another gentleman who spoke stated

* *Inventor's Advocate.*

that the new mode was already on its decline in Vienna, where it had been longest known.

THE POCKET FORMULARY; *and Synopsis of the Pharmacopœias; comprising Standard and Appointed Formulæ for more than* 500 *officinal and extemporaneous compounds employed in Medical Practice; arranged in alphabetical order.* London: Sherwood, Gilbert and Piper.

This is an extremely convenient and useful little work, containing all that is required for most ordinary purposes. Every medical practitioner and chemist and druggist should carry it about him.

BOOKS RECEIVED.

Practical Remarks on the New Operation for the Cure of Strabismus, or Squinting. Illustrated with Lithographic Engravings by Bagg. By Edward W. Duffin, M.R.C.S.L. & E. London: *John Churchill.*

Agricultural Chemistry. By the Rev. C. A. A. Lloyd. Written and published at the request of the Members of the Sbropshire Natural History Society, and delivered before them on the 3d of April, 1840. Shrewsbury: *G. Matthews,* High Street.

[The Copy sent to us unfortunately is imperfect, many leaves heing out. If favoured with a perfect copy we shall be happy to notice it.]

A Tabular View of the Yearly Quantity of Rain which falls in different parts of Great Britain. By Joseph Atkinson, Harraby, near Carlisle.

TO CORRESPONDENTS.

Although we beartily approve of the laudable objects of the tract—"On the Duty of being Scientific," we cannot give insertion to it, as requested by its worthy compiler.

An Apprentice.—There is Dr. Ure's Dictionary: hut we recommend the new edition of Dr. Turner's Elements of Chemistry, (a notice of whicb appears in the present No.) as being eminently calculated for a beginner.

Gulielmus. We consider oil preferable to naphtha. Our correspondent will not find it practicable to manufacture his own gas.

Mr. Shaw will be attended to in our next.

N. R.'s communication on tbe subject of mercurial ointment and blue pill has been superseded by otbers; we have not, therefore, inserted it. The other subject shall he attended to next month.

Communications Received from A. B.; Mr. Henry Dunn; A Chemist and Druggist; P. H. G.; W. D.; Mr. Alfred Smith; G. F. D.; and Mr. Millns.

Will Mr. A. Walter, of Brighton, at whose conduct we are much surprised, favor us with a reply to our numerous letters, which we know be has received?

Medicus, and all our correspondents who have written us on the subject, are informed that all the numbers of The Chemist are now to be had of our Publisher.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr Hastings, Publisher,* 13, *Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the* 15*th of each month; Books for Review, before the* 10*th.*

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THE CHEMIST.

I. CHEMISTRY.

ON THE SOLUBILITY OF SILVER IN SULPHATE OF PEROXIDE OF IRON.*

BY M. VOGEL.

Some years ago, M. Wetglar, of Hanau, observed that a solution of sulphate of iron had the property of dissolving a small quantity of silver at the ordinary temperature. He had observed, moreover, that proto-sulphate of iron did not precipitate the whole of the silver from a neutral solution of nitrate of silver, which is not in accordance with hitherto received opinions. In order, therefore, to add to our knowledge concerning the actions which take place between silver and sulphate of peroxide of iron, I have made some experiments on the subject.

I steeped a sheet of silver in a boiling and very weak and neutral solution of persulphate of iron. The metal was immediately attacked, and was covered with a blackish layer. When the colorless solution of persulphate of iron was boiled with the silver, it acquired a yellowish color, which disappeared on cooling: I ascertained, however, that the silver is not the cause of this change of color, for when a dilute solution of persulphate of iron is boiled, without the addition of silver, it likewise assumes a reddish yellow tint which it retains so long as it is kept boiling, without any apparent change in the oxidation, and it again becomes colorless on cooling. The same phenomenon also presents itself with many metallic oxides, which, at a high temperature, affect other tints, without undergoing any perceptible change in their composition.

When the persulphate of iron had been kept boiling for a quarter of an hour, and the silver did not appear to diminish in bulk, I withdrew it, and steeped it in another solution of persulphate of iron, in which it entirely dissolved after a few minutes' boiling.

Potassa and ammonia formed in the solution a blackish brown precipitate. Hydrochloric acid occasioned a copious white precipitate, insoluble in nitric acid, which had all the appearance of chloride of silver. Ferrocyanuret of potassium, which did not effect any change in the solution of persulphate of iron before the silver had been steeped in it, produced in this solution, containing silver, a blue precipitate: whence it results that, by the boiling with silver, protoxide of iron had been formed.

The argentiferous liquid was evaporated to dryness, and the residue was dissolved in boiling water, from which, at the expiration of twenty-four hours, small crystals of sulphate of silver were deposited, accompanied by bracteæ of metallic silver. The solution separated from these crystals still contained silver and protoxide of iron, for hydrochloric acid formed in it a white precipitate, and ferrocyanuret of potassium, a blue one, and cyanuret of sulphur turned the liquor of a blood red: whence it follows that sulphate of silver may exist in a liquor with protosulphate and persulphate of iron, without being decomposed by the former.

None of these phenomena are observed when metallic silver is put in a boiling solution of protosulphate of iron; the silver is not attacked, nor does the liquor change colour.

As the persulphate of iron used in these experiments was the result of the action of nitric acid on green sulphate of iron, I feared that a small quantity of nitric acid might be left in, which would favor the oxidation and solution of the silver. To remove all doubt on this point, I dissolved some hydrated oxide of iron in sulphuric acid perfectly free from nitric acid, and I put in this solution, which was as neutral as possible, and boiling, a thin piece of silver: it likewise turned black, and disappeared after a short time.

Persulphate of iron formed by the calcination of green vitriol also dissolved silver

* *Journal de Pharmacie*, Dec., 1840.

by boiling. In general, when green vitriol contains only a very small quantity of persulphate of iron, it dissolves silver, part of which, on the cooling of the liquor, is reduced by the great excess of protosulphate of iron.

We have already seen that the concentrated solution of sulphate of iron and silver deposited crystals on cooling; these crystals, however, bore no resemblance to the double salt of oxide of iron and oxide of silver described by Lavini; this deposit is nothing more than a mixture of sulphate of silver, sub-sulphate of iron, and reduced silver. Moreover, I ascertained by the following experiment, that the silver is not dissolved in sufficient quantity to form a double salt:—

Half an ounce of well dried persulphate of iron was dissolved in two ounces of water. After putting a thin piece of silver, weighing 24 grains, into it, I boiled it for half an hour, and then removed the piece of silver, which still weighed 7·5 grains; only 16·5 grains, therefore, had been dissolved by the persulphate of iron,—too small a quantity for forming a double salt with the sulphate of iron.

That the white precipitate which sea-salt occasions in this ferruginous solution, arises from silver, is beyond doubt; but the precipitate has this peculiarity, that held in suspension in the liquid, and exposed for several hours to the solar rays, it does not perceptibly lose its whiteness. The solution of persulphate of iron, therefore, is a preservative of chloride of silver, and prevents it from being blackened by the sun. This may be seen to a certain extent when common salt is added to a solution of persulphate of iron, mixed with nitrate of silver; on exposing the mixture to the sun's action, the chloride of silver remains white longer than when no persulphate of iron is present.

A similar phenomenon was long since observed by M. Gay-Lussac, in nitrate of silver containing a little mercury, and precipitate by common salt; in this case the chloride of silver did not blacken in the sun.

It appears that the property of protecting chloride of silver from the action of the solar light, belongs only to the mercurial and ferruginous salts; for by adding common salt to solutions of sulphate of copper, sulphate of zinc, and sulphate of manganese, all of which were mixed with nitrate of silver, the white precipitate which resulted turned black on exposure to the sun, as quickly as without the addition of these different metallic salts.

If sulphate and acetate of iron protect chloride of silver from the action of the sun for some time, it is still more securely and remarkably effected by the use of a mecurial salt.

A sheet of silver is quickly attacked by corrosive sublimate dissolved in water; the metallic lustre of the silver immediately disappears, and a grey powder is formed; but on boiling the solution of corrosive sublimate, containing the silver, a white powder, which does not turn black in the sun, is formed. This powder, which is insoluble in water, becomes black on contact with ammonia, and chloride of silver may be separated from the ammoniacal solution, by means of nitric acid. The white powder is allowed to partially sublime in glass tubes: the unsublimable residue fuses at a higher temperature, and dissolves in ammonia; therefore it acts like a mixture of chloride of silver and chloride of mercury (calomel).

When corrosive sublimate, dissolved in water, is kept boiling for a sufficient time with an excess of silver, it is entirely decomposed into two insoluble chlorides of silver and mercury; but the decomposition goes no farther—calomel does not yield chlorine to silver.

From the above experiments it results:—

1. That silver is oxidised and dissolved in a solution of sulphate of peroxide of iron.

2. That in this case a double salt of the two oxides of silver and iron with sulphuric acid is not formed, but rather sulphate of silver, whose oxide is not reduced by the green sulphate of iron produced by this action.

3. That the sulphate of silver does not undergo any reduction when in solution, by the sulphate of protoxide of iron, accompanied by an appreciable quantity of persulphate of iron.

4. That chloride of silver held in suspension in a solution of sulphate of peroxide of iron, resists, for a long time, the action of the solar rays, without being blackened.

5. That corrosive sublimate, in its aqueous solution, is half decomposed by silver; that it yields one atom of chlorine to form chloride of silver, and is converted into protochloride of mercury or calomel.

INVESTIGATIONS CONCERNING THE SALTS OF LEAD FORMED BY HYPONITRIC AND NITROUS ACIDS.*

BY M. EUGENE PÉLIGOT.

Proust was the first who observed that lead is dissolved in considerable quantity when put in contact with a heated solution of nitrate of lead: the salt produced depo-

* *Académie des Sciences; Comptes Rendus*, No. 21, 11 Nov. 1840.

sits on cooling, in the form of shining yellow scales.

The conclusion which Proust drew from this fact was, that the oxide of lead is reduced to a degree of oxidation inferior to the protoxide; but Berzelius, in a work published in 1812, showed that the solution of lead is effected, not by the reduction of the oxide of lead, hut at the expense of the nitric acid contained in the salt employed.

In an experiment made and published at the same period, M. Chevreul arrived at the same conclusion, and described two distinct salts formed by the action which different quantities of lead exert on the nitrate of lead; and, in a second memoir on this subject, he noticed the similarity of the analyses, and the differences in the properties presented by the salts, simultaneously studied by Berzelius and himself.

Being led, in the course of the investigations concerning nitrous and hyponitric acids which I have undertaken, to analyse Proust's salt, I obtained results, the interpretation of which does away with much that is at present admitted as to the nature of this body. Indeed, I think that I can demonstrate that there exist three very distinct compounds, formed by the action of lead on nitrate of lead: two of these combinations contain, not nitrous acid, as Berzelius and Chevreul affirm, but *hyponitric acid;* thus, the latter acid, which, according to Dulong's analyses, is formed of two volumes of nitrogen and four volumes of oxygen, would be capable, contrary to all received opinions, if not of directly combining with bases, at least of existing in combination with them, like nitric acid.

I have prepared Proust's salt by putting one equivalent of lead to one equivalent of nitrate of lead. It is best to put 63 of lead to 100 of nitrate. If 78 of lead he employed, as proposed hy Berzelius, a mixture is obtained, as Chevreul ohserved, of yellow salt with the orange salt, which is afterwards formed. If, on the contrary, less than an equivalent of lead be employed, a mixture of bibasic nitrate of lead is obtained.

The action is kept up and terminated at from 60° to 70° C., without any disengagement of binoxide of nitrogen: this gas is produced only by the decomposition of the yellow salt produced.

When this salt is mixed with the orange-colored salt, it may be separated by treating the mixture with a quantity of warm water insufficient for wholly dissolving them, profiting by the much greater solubility of the orange salt.

The analyses of this salt consist in the direct determination of the oxide of lead, and of the nitrogen and water which it contains.

The results which I have obtained perfectly agree with the formula:—

$$N O^4, 2\,Pb\,O, H\,O.$$

They agree equally well with the proportion of oxide of lead of Berzelius aad Chevreul: but Berzelius, who has not ascertained the quantity of nitrogen, admits, hypothetically, and relying on the necessary existence of nitrous acid in this salt, that it should contain 6·4 of water per cent.: the experiment gives only 3·2.

Thus the very simple equation:—

$$N O^5, Pb\,O + Pb + H\,O = N O^4, 2\,Pb\,O, HO,$$

accounts for the production of this salt, which, hitherto, was very obscure.

The second salt which is produced is of a orange red color: it is obtained hy dissolving in the boiling solution of one equivalent of nitrate of lead, an equivalent and a half of lead; on cooling, a mixture of orange and salt is obtained; the latter is separated by means of boiling water, the former being less soluble.

The analyses of this salt coincide with the formula:—

$$N^2, O^8, 7\,Pb\,O, 3\,H\,O.$$

The composition of this salt is confirmed by synthesis; for by boiling hihasic hyponitrate of lead with oxide of lead, the same orange colored salt is obtained.

The prolonged ebullition of a solution of nitrate of lead with two, three, or more equivalents of lead, furnishes the rose-colored salt mentioned by Chevreul, the composition of which, according to his analyses, those of Berzelius, and mine, is represented by the formula:—

$$N O^3, 4\,Pb\,O, H\,O.$$

The water contained in these salts is not disengaged except at a temperature exceeding 100° C.

It is only with the rose salt and carbonic acid that the neutral nitrate of lead can be prepared; the yellow liquor which contains it, evaporated *in vacuo*, yields yellow, elongated prisms. This salt is very different from that described by Berzelius, which he obtained necessarily mixed with nitrate of lead, since he used Proust's yellow salt to produce it.

As by the processes of direct analyses, the differences which exist between the results of calculation, and those of experiment relate to the oxygen combined with the nitrogen to form nitrous or hyponitrous acid; and as this determination of oxygen is the culminating point of the question, I have endeavoured to ascertain more directly the quantity of those elements, availing myself, in the first place, of the property which each of the three salts possesses of dissolving integrally in cold acetic acid, even when concentrated and in excess; and, in

the second place, of the action which peroxide of lead exerts on these salts thus dissolved. This action consists in yielding oxygen to the nitrous or hyponitric acid to convert it into nitric acid; nitrous acid dissolving one part more of peroxide of lead than the hyponitric acid, and this oxide presenting a very high atomic weight, the employment of peroxide of lead appeared to me to be calculated to give conclusive results as to the constitution of these salts.

The results which I have obtained by putting these bodies in contact, after taking their weight, and by determining the quantity of peroxide of lead dissolved by each of the acids, contained in these salts, fully confirm the formulæ which I have adopted for representing their several compositions.

CHEMICAL INVESTIGATIONS CONCERNING THE ESSENTIAL OILS.*

BY MM. C. GERHARDT AND A. CAHOURS.

Hitherto the essential oils have been the subject of but few investigations; some of them only have been submitted to a thorough investigation, and that is owing to the difficulties in purifying them. Indeed, but few have been obtained in the crystallized state: they are, for the most part, liquid, and constitute mixtures of two, and even three peculiar principles, which we are but rarely able to separate by distillation at different temperatures.

We have undertaken a series of investigations concerning this class of bodies, and we have been fortunate enough to find a very simple process of separating, in a state of purity, the heterogeneous two principles of which many essential oils are composed.

Many chemists have proved the fact that the essential oils, which are naturally produced in plants, and which are extracted from them by simple distillation, are mixtures, in variable proportions, of an oxygenous oil and of a hydrocarbon. Sometimes the oxygenous oil is crystallized, whilst the principle which accompanies it affects the liquid state; in this case the separation of the first easily succeeds; but it is not so with the hydrocarbon, which is always obtained mixed with a certain quantity of the other product. The distillatory process not being of a nature to remove these difficulties, it was necessary to find a chemical agent which, put in contact with an essential oil, should extract from it the oxygenous principle and permit the hydrocarbon to be disengaged without alteration. Now we have found potassa in fusion answer this purpose perfectly well.

The employment of potassa in fusion, has allowed of our ascertaining the presence of two peculiar principles in several essences, among which, those of cumin, valerian, and chamomile have chiefly engaged our attention. Each of these three essences contains an oxygenous oil, which potassa converts into an acid, and a hydrocarbon, on which that substance has no action. The hydrocarbon of the essence of valerian is converted into common camphor under the influence of nitric acid.

We now publish the results to which the study of the essence of cumin has led us; our investigations concerning the other two will form the subject of another Memoir.

The essential oil of cumin pre-exists in the seed of that name: it is not, like the essences of mustard and bitter almonds, the result of the action of water on certain principles which constitute the seed. To ascertain this fact, we treated the latter successively with water, anhydrous alcohol, and pyroxylic spirit, and these various modes of treatment have always yielded the same oil.

This oil contains two principles: the oxygenous one forms the basis of a series of very interesting combinations, greatly analogous to those which the study of the essential oil of bitter-almonds has lately made us acquainted with.

This body, whose composition is represented by

$$C^{40}\,H^{24}\,O^{2} = 4 \text{ vol. of vapor},$$

yields, under the influence of the alkali and of most oxygenating bodies, a peculiar acid

$$C^{40}\,H^{24}\,O^{4},$$

which may easily be obtained in the crystallized state. The preparation of this new acid is carried on with such rapidity, that a kilogramme may easily be produced in an hour.

Under the influence of chlorine and bromine, the oxygenous principle yields bodies derived by substitution of the same type:—

$$C^{40}\,H^{22}\,Cl^{2}\,O^{2} \text{ and } C^{40}\,H^{22}\,Br^{2}\,O^{2}.$$

These compounds are converted into the acid of which we have spoken, when they are subjected to the action of water.

Put in contact with potassium, the oxygenous principle of the essence of cumin disengages hydrogen and produces a combination

$$C^{40}\,H^{22}\,KO^{2},$$

which may be assimilated to salicyluret of potassium. Water decomposes this compound into primitive oil and potassa.

The peculiar acid which results from the oxidation of the essence of cumin, gives, when submitted to the action of heat with an excess of base, a hydrocarbon

$$C^{36}\,H^{24} = 4 \text{ vol. of vapor},$$

which has some of the properties of Mits-

* *Comptes Rendus*, No. 22., Nov. 30, 1840.

cberlich's benzine. Thus it combines witb sulphuric acid, producing a vinic acid, whose salts crystallize beautifully. Tbe salt of baryta bas the composition

$C^{36} H^{22} S^2 O^5 Ba O.$

Finally, the chief hydrocarbon found in essence of cumin, has the composition

$C^{40} H^{26}$ = 4 vol. of vapor.

It is likewise very analogous to benzine, for it combines, like it, with sulphuric acid, forming a new vinic acid. The composition of the salt of baryta obtained with it, is represented by

$C^{40} H^{26} S^2 O^5, BaO.$

Tbe two principles which constitute essence of cumin, the history of which we bave just sketched, give rise, as is seen, to many remarkable transformations. Their products are distinguished by their clearness of form and composition.

EXAMINATION OF A NEW FAT ACID EXTRACTED FROM PALM OIL.*

BY M. FRÉMY.

Tbe very curious observations on palm oil lately publisbed by MM. Pelouze and Felix Boudet, should induce chemists attentively to study the solid fat acid which may be procured by saponification from this oil, and whicb may even be spontaneously formed in it, according to MM. Pelouze and F. Boudet's investigations.

The experiments which I now have the honour of communicating to the Academy bave been completed for several months. It was my intention to have extended the observations which I have made on palm oil; but M. Liebig has prevented me by informing me that in bis laboratory results identical witb mine bad been obtained. I have therefore thought it best immediately to publish a brief detail of my investigations.

I extracted from palm oil a solid fat acid whicb I purified by the common means, and wbich greatly resembles margaric acid.

It has the same point of fusion as margaric acid: it melts at 60° C.

It presented the following composition:—

1st		Hundredths. 1st	2nd	Atoms.	Theory.
M = 0·2605 .... M = 0·2345	C =	75·4	75·1	C^{64}	C = 75·37
Water = 0·295 .... Water = 0·264	H =	12·5	12·4	H^{126}	H = 12·40
A.c. = 0·711 .... A.c. = 638	O =	12·1	12·5	O^8	O = 12·23
		100·0	100·0		100·00

Tbe acid of palm oil, heated to 250° C, crystallizes in alcohol in small and very bard crystals, while before it crystallized in beautiful plates.

I analysed tbe acid when tbus modified: it bad undergone no cbange of composition:—

	Hundredths.
M = 0·279	C = 75·20
Water = 0·314	H = 12·49
A. c. = 0·775	O = 12·31
	100·00

It is volatile without decomposition. Tbe following is an analysis of the distilled acid:—

	Hundredths.
M = 0·256	C = 75·38
Water = 0·393	H = 12·70
A. c. = 0·698	O = 12·12

The capacity of saturation of the acid of palm oil was determined by analysing some salts of silver.

1st	2nd	3rd
Salt of Silver . . . 0·188	Salt of Silver . . . 0·168	Salt of Silver . . . 0·394
Oxide . . . . . 0·060	Oxide . . . . . 0·052	Oxide . . . . . 0·124
Acid . . . . . 0·128	Acid . . . . . 0·116	Acid . . . . . 0·270
Or 31·9 of oxide per cent.	Or 30·9 of oxide per cent.	Or 31·4 of oxide per cent.

4th	5th	6th
Salt of Silver . . . 0·319	Salt of Silver . . 0·2295	Salt of Silver . . . 0·338
Oxide . . . . . 0·100	Oxide . . . . . 0·0730	Oxide 0.107
Acid 0.219	Acid . . . . . 0·1365	Acid . . . . . 0·231
Or 31·3 of oxide per cent.	Or 31·8 of oxide per cent.	Or 31·6 of oxide per cent.

* *Academy of Sciences*, Paris: *Comptes Rendus*, No. 21, Nov. 23, 1840.

Representing the salt of silver by the following formula :—

$$C^{64}\ H^{124}\ O^{6} + 2\ Ag\ O,$$

theory gives 31·6 of oxide of silver per cent. This number does not differ much from those which I found.

I determined the composition of the anhydrous acid by analysing three salts of silver.

1st		2nd		3rd	
Salt	= 0·3985	Salt	= 0 424	Salt	= 0·4275
Acid	= 0·273	Acid	= 0·291	Acid	= 0·2880
Water	= 0·309	Water	= 0·331	Water	= 0·3190
A. c.	= 0·771	A. c.	= 0·833	A. c.	= 0·8130

Hundredths. 1st	2nd	3rd	Atoms.	Theory.
C = 78·08	78·19	78·05	C^{64}	C = 78·08
H = 12 55	12·62	12·29	H^{124}	H = 12·35
O = 9·37	9·19	9·66	O^{6}	O = 9·57
100·00	100·00	100·00		100·00

It is evident that the acid of palm oil may be considered as a bibasic acid. I have ascertained that it formed salts in which the acid was saturated by one atom of base and one atom of water.

I may give as an example the analysis of a salt of ammonia which is insoluble in cold water.

Salt of Ammonia	=	414
Water	=	475
Carbonic Acid	=	1·092
Hundredths	C =	72·93
	H =	12.70

By the ordinary processes I found that this salt contained 2·9 of nitrogen.

This analysis leads to the following formula :—

$$C^{64}\ H^{124}\ O^{6},\ N^{2}\ H^{6}\ O,\ H^{2}\ O.$$

Theory =	
	C = 72·9
	H = 12·4
	N = 2·7
	O = 12·0
	100·0

The acid of palm oil forms an ether which crystallizes very well, and which melts at a very low temperature. The following is its composition :—

		Hundredths. 1st	2nd Atoms.	Theory.
M	= 0·372	C = 76·1	76·6..C^{72}	C = 76·8
Water	= 0·406	H = 12·6	12·5..H^{144}	H = 12·4
Carbonic Acid	= 0·990	O = 11·3	10·9..O^{8}	O = 10·8
		100·0	100·0	100·0

This ether is therefore represented by the formula

$$C^{94}\ H^{124}\ O^{6},\ 2\ (C^{4}\ H^{10}\ O).$$

Finally, I examined the action of chlorine on the acid of palm oil, subjecting it to the influence of heat and light. I thus obtained a series of chloruretted acids, all of which seemed to possess the same capacity of saturation as the acid of palm oil. The chlorine entering into these combinations displaces an equivalent quantity of hydrogen. I passed a current of chlorine for nearly a month into the acid which I exposed to the influence of the solar radiation : I analysed the products. The last product analysed contained 60 per cent. of chlorine, and 3·9 per cent. of hydrogen. At this time the chlorine acted on the organic matter, but very slowly. The most stable compound, and that which is always obtained by passing a current of chlorine into the liquid acid, is that which is represented by the following formula :—

$$C^{64}\ H^{108}\ Cl^{16}\ O^{6}.$$

The first obtained chloruretted acids are liquid at the ordinary temperature, the last are hard and transparent like a resin.

I have ascertained that all the fat acids act in the same way, under the influence of chlorine.

The interest attaching to the study of these new compounds is well understood.

The different bodies of which I have spoken in this memoir, have been analysed by the ordinary process; I have not employed chlorate of potassa for terminating the combustion; I have used the old atomic weight of carbon in calculating my formulæ.

I have ascertained by direct experiments that the formulæ would not be altered by adopting the number 75 for the weight of the atom of carbon, and by passing into the tube, after combustion, a current of oxygen. I will resume this subject when M. Dumas's experiments on the atomic weight of carbon are published.

To conclude, MM. Pelouze and F. Boudet have analysed the solid acid of palm oil: the numbers which they found perfectly agree with those mentioned by me in this memoir.

ON CERTAIN PRODUCTS OF THE DECOMPOSITION OF OIL OF BITTER ALMONDS.*

BY M. N. ZININ, OF CASAN.

M. Zinin has observed, in the ordinary method of preparing benzoïn, namely, by dissolving oil of bitter almonds in lime water or baryta water, heating the solution in hot water, &c., that the aqueous solution of pure hydruret of benzoïle is most easily converted, by the addition of a little cyanuret of potassium, into quite pure white benzoïn. He then also tried treating oil of bitter almonds containing prussic acid, by a recent alcoholic solution of potassa, prepared with or without heat, but saturated; and he saw the liquor in a few minutes resolve itself into a solid, yellow, crystalline mass, which was benzoïn mixed with a small quantity of a resinous substance, formed by the reaction of the potassa on the alcohol. Pure benzoïn is obtained by crystallizing, several times, the alcoholic solution. The liquor from which the benzoïn is deposited, is strongly alkaline, and the weight of the benzoïn is almost equal to that of the oil of bitter almonds employed.

Pure hydruret of benzoïle, mixed with weak alcoholic solution of cyanuret of potassium, is quite as easily converted into almost colorless benzoïn. It is not the same with the cyanurets of mercury and zinc.

All the oils of bitter almonds do not furnish the same quantity of benzoïn, nor of the same degree of purity; that depends on the proportion of hydro-cyanic acid which they contain, and on their freshness.

M. Laurent has observed that dry benzoïn, when melted, is converted, by the action of dry chlorine gas, into benzile, with a disengagement of hydrochloric acid. Treated by nitric acid, benzoïn gives the same body. On dry benzoïn, we pour about double its weight of nitric acid, and a gentle heat is applied. There is a powerful disengagement of nitrous acid, and the benzoïn is fused: then a clear, yellow, oily substance rises to the surface. As soon as this liquid becomes completely transparent, the disengagement of nitrous acid ceases, and the operation is terminated. The oil which floats on the surface is pure benzile. It may be boiled with nitric acid without decomposition. Benzile is very soluble in ether. By the spontaneous evaporation of this solution, long transparent crystals may be obtained. They are hexahedral prisms.

If the oil of bitter almonds or hydruret of benzoïle be mixed with about $\frac{1}{4}$ of its bulk of almost anhydrous hydrocyanic acid, and stirred, and added to an equal bulk of a concentrated solution of potassa diluted with six parts of alcohol, and stirred and gently heated, on the liquor being left to itself, after some time, a white, flaky, caseïform body is formed; it is the same as that produced in the preparation of benzoïn, when the oil of bitter almonds contains much hydrocyanic acid.

The liquor was decanted and the substance was boiled with water, in which it is entirely insoluble, and which completely removes from it the benzoïn and other foreign matters, and it was purified by solution in alcohol.

This body is under the form of a light flaky mass, of a white color, or slightly tinged with green; it is very little soluble in alcohol and ether; it dissolves in concentrated sulpburic acid, assuming a fine emerald green color, which afterwards turns to red; water precipitates this body from it without alteration; nitric acid dissolves and decomposes it. It is insoluble in hydrochloric acid and a solution of potassa. It bears a great resemblance, in appearance and chemical properties, to the substance described by M. Laurent, under the name of benzimide; but its analysis gives a very different composition. The composition of the new body may be expresed by the following formula:—

		Calculated.	Found.	
46 At.	Carbon .	78·22	78·40	78·28
36 —	Hydrogen	4·99	5·09	5·20
4 —	Nitrogen	7·87	7·76	,,
4 —	Oxygen	8·92	8·75	,,

Which explains the probable mode of its formation: indeed, 3 eq. of hydruret of benzoïle, with 2 eq. of hydrocyanic acid, minus 2 eq. of water, give the composition of this body.

* *Annalen der Chemie. und Pharmacie.*

M. Zinin could not perceive any action of the hydrocyanic acid on the benzoïn; but if benzine be dissolved in boiling alcohol, and if a nearly equal weight of almost anhydrous hydrocyanic acid be added, on the liquor being allowed to settle, beautiful rhomboïdal tables of a brilliant white, and of a vitreous lustre, produced by the combination of a rhombo-octobedron with a right prism. They melt on the application of heat, and are decomposed, leaving a residue of benzile. They are not decomposed by boiling water, nor by concentrated boiling hydrochloric acid. Heated with ammonia, or with nitric acid, they also leave a residue of benzile. If the alcoholic solution of these crystals be mixed with an alcoholic solution of nitrate of silver, cyanuret of silver and benzile crystallizes out of the solution. If the alcoholic solution of this body be heated with deutoxide of mercury, that oxide is reduced, and the odor of benzoïc ether is very strongly perceptible. It is formed of

	Calculated.	Found.	
16 At. Carbon	72·93	72·948	72·983
12 — Hydrogen	4·46	4·576	4·577
2 — Nitrogen	10·55	10·390	,,
2 — Oxygen	12·06	,,	,,

Consequently, this body is formed by the combination of one eq. of benzile, with one eq. of hydrocyanic acid.

It might be named *cyanhydro-benzile.*

If an alcoholic solution of benzile, not too concentrated and quite warm, be mixed with liquid ammonia, a white precipitate in fine grains is formed, which, exposed for about ten hours to a heat of about 70° C., and then redissolved in alcohol, after being washed, gives crystals: these are tables, or white, long, thin, and flat needles, with a brilliant rainbow (irisé) lustre: they are nearly insoluble in water: the aqueous solutions of ammonia and potassa do not dissolve them; the alcoholic solutions of these two bodies and hydrochloric acid, dissolve them, and let them crystallise without alteration. The alcoholic solutions of nitrate of silver and acetate of lead cause no precipitate in the solution of this body. Its composition may be expressed as follows:—

	Calculated.	Found.	
42 At. Carbon .	85·51	85·49	85·61
30 — Hydrogen	4·95	5·12	5·24
2 — Nitrogen	4·69	4·85	4·44
2 — Oxygen.	4·85	,,	,,

There is formed at the same time as this body in the solution of benzile treated by ammonia, benzoate of oxide of ethyle, and probably another substance, more soluble in alcohol, which crystallizes in small needles, and which has not been farther studied. The simultaneous production of benzoïc ether explains the formation of the body described above.

COMPOSITION OF THE SUGAR OF GELATINE AND NITRO-SACCHARIC ACID.*

BY M. BOUSSINGAULT.

Two years ago I devoted myself to the study of the saccharine matter obtained by M. Braconnot, by treating glue with sulphuric acid. It may be recollected that the existence of the sugar of gelatine had been doubted by many chemists. By following M. Braconnot's directions, I obtained from it the two substances described by him—sugar and leucine; but after a few experiments made with the view of fixing the composition of these two bodies, I was obliged to interrupt my investigations.

Since then, other chemists have touched on this subject; the results which they have obtained agree in some respects with mine; in others they totally differ from them. As I have done all in my power to give accuracy to my analyses, I can but mention these differences; future experiments will show on which side the errors lie.

SUGAR OF GELATINE.

The properties of the sugar of gelatine are sufficiently described in M. Bracconnot's work. Its composition, deduced from the analyses of products of different origin, is:—

	Found.	Calculated.	
Carbon . .	33·85	34·00	C^{32}
Hydrogen .	6·44	6·36	H^{36}
Nitrogen . .	20·00	20·05	N^{8}
Oxygen . .	39·71	39·59	O^{14}

By means of a few precautions mentioned in my memoirs, sugar of gelatine may easily be combined with oxide of silver. The combination is under the form of colorless crystals, it is not very soluble in cold water.

	Sugar combined.	Combination.
Carbon . .	37·67	13·66
Hydrogen .	6·12	1·21
Nitrogen . .	22·26	8·07
Silver . . .	——	63·95
Oxygen . .	33 95	12·31

A composition which leads to the following formula:—$C^{32}\ H^{30}\ N^{8}\ O^{11}\ (Ag\ O)^{4}$.

	Sugar combined.	Combination.
Carbon . .	37·65	13·33
Hydrogen .	5·86	2·08
Nitrogen . .	22·16	7 87
Silver . . .	——	64·50
Oxygen . .	34·43	12·22

The sugar of gelatine very readily combines with the oxides of copper and lead.

* *Comptes Rendus de l'Académie des Sciences;* No. 23,—23d Dec., 1840.

These two compounds are very soluble in water.

The cupreous compound is obtained in an azure blue, crystalline mass: its analysis fully confirms the formula drawn from the oxide of silver.

The compound with lead crystallizes in beautiful colorless needles: its solution is entirely decomposed by carbonic acid.

I have experienced some difficulties in obtaining this compound in uniform proportions. The proportion of oxide of lead has sometimes varied from 63½ to 64½. By sufficiently prolonged treatment, a salt containing 64·9 gr. of oxide may be obtained,—a quantity much too great for the formula adopted.

Sugar.		Combination.		
	Found.	Calculated.	Found.	Calculated.
C	37·55	37·55	C 13 29	13.68
H	5·90	5·96	H 2·04	2·13
N	22·20	22·16	N 7·58	8·07
O	34·27	34·43	O 11·99	12·54
			PbO 64·96	63·58

NITRO-SACCHARIC ACID.

This acid is prepared by dissolving the sugar of gelatine in dilute nitric acid. It is gently heated, and on cooling the solution crystallizes: no action is observable; it is really a simple solution of the sugar in the acid.

Nitro-saccharic acid has a very sour, and at the same time a very sweet taste.

I have analysed it in three states: crystallized, dried at 110° C., and in salts.

Dried at 110° C., nitrosaccharic acid contains:—

Found.		Calculated.	
C	18·1	C^{32}	18·2
H	4·2	H^{42}	4·0
N	21·2	N^{16}	21·5
O	56·5	O^{37}	56.3

Nitro-saccharate of silver very readily crystallizes. Many accidents which I met with in heating the nitro-saccharates of lead and copper made me take some precautions in decomposing the nitro-saccharate of silver. To my great surprise I very soon found that these precautions were completely useless. It burns without detonating. Its composition is:—

	Acid.	Salt.
Carbon	19·61	10·08
Hydrogen	3·63	1·86
Nitrogen	23·01	11·83
Oxygen	53·75	27·63
Silver	——	48·60

The atomic weight deduced from this composition, supposing an atom of base in the salt, is 1535·2. But the atomic quotients evidently indicate that nitro-saccharic acid is polybasic. These quotients are:—C. 8·0; H. 8¾; N. 4·0; O. 8¼, &c.; consequently nitro-saccharate of silver becomes—$C^{32}\ H^{34}\ N^{16}\ O^{33}\ (Ag\ O)^4$. Thus the acid dried at 110° loses four atoms of water, which are replaced by four atoms of oxide of silver.

It is sufficient to look at the formulæ contained in my Memoir, to be convinced that in nitro-saccharic acid, the nitric acid remains unmodified.

The nitro-saccharates may be represented as resulting from the union of nitric acid with the corresponding saccharate, or as the combination of the sugar of gelatine with a nitrate; indeed the nitro-saccharates may be obtained by treating the saccharates with nitric acid.

Uncombined sugar of gelatine	$C^{32}\ H^{36}\ N^8\ O^{14}$
Sugar in the salts	$C^{32}\ H^{30}\ N^8\ O^{11}$
Combination with silver	$C^{32}\ H^{30}\ N^8\ O^{11}\ (AgO)^{\frac{1}{2}}$
Cupreous combination	$C^{32}\ H^{30}\ N^8\ O^{11}\ (CuO)^4$
Combination with lead	$C^{32}\ H^{30}\ N^8\ O^{11}\ (PbO)^4$
Crystallized nitro-saccharic acid	$C^{32}\ H^{30}\ N^8\ O^{11}\ (N^2\ O^5)^4\ (H^2\ O)^9$
Acid dried at 110° C	$C^{32}\ H^{30}\ N^8\ O^{11}\ (N^2\ O^5)^4\ (H^2\ O)^3$
Acid in the salts	$C^{32}\ H^{30}\ N^8\ O^{11}\ (N^2\ O^5)^4\ (H^2\ O)^2$
Nitro-saccharate of silver	$C^{32}\ N^{30}\ N^8\ O^{11}\ (N^2\ O^5)^4\ (AgO)^4\ (H^2O)^{\frac{1}{2}}$
Nitro-saccharate of potassa	$C^{32}\ H^{30}\ N^8\ O^{11}\ (N^2\ O^5)^4\ (K\ O)^4\ (H^2\ O)^2$

ON HYDRATE OF PHOSPHORUS.*

BY R. F. MARCHAUD.

Pelouze was the first who considered the white crust which covers old phosphorus as a hydrate of phosphorus. H. Rose regards it simply as a modification in the state of aggregation. Mulder, again, thinks that it is a combination of oxide of phosphorus with phosphuretted hydrogen. He remarks that the white sticks of phosphorus acquire a red color in distilled aërated water, and he immediately obtained a similar white substance by directing phosphuretted hydrogen on to red oxide of phosphorus.

M. Marchaud, being desirous of resolving this question, strongly pressed a certain quantity of this white crust, between leaves of filtering paper, as M. Rose had done; then he put it in a porcelain capsule over sulphuric acid, under the pneumatic apparatus, and left it for several days *in vacuo*. The first

* *Journal für Praktische Chemie;* vol. xx.

night a faint light might be observed; but it very soon disappeared. When the air was allowed access to it, the mass inflamed as phosphorus would have done under the same circumstances.

A new quantity of white crust was also dried over sulphuric acid, but under a bell in which was no vacuum. M. Marchaud afterwards placed it, like M. Rose, in a long glass tube, previously weighed, hermetically sealed at the inferior extremity. He determined its quantity, and plunged it into hot water. There was a slight disengagement of humidity, very probably hygrometric, and the residue, *which was converted into ordinary phosphorus*, was weighed; the weight had diminished little or nothing.

In order to confirm M. Mulder's assertions, the author put some sticks of phosphorus, which had become white, into aërated water; he left them there for several weeks without observing any change of color; then he directed on them a current of oxygen, under water, without any perceptible effect. Like M. Mulder, he obtained the combination of oxide of phosphorus, and phosphuretted hydrogen, and he likewise found that it very much resembled the white crust; but the manner in which it is affected by heat appeared very different.

He thinks, therefore, that he may conclude from his experiments, that the white crust is only, as M. Rose first thought, phosphorus in another state of aggregation.

ON THE PROPERTY WHICH ANIMAL MATTERS POSSESS OF DECOMPOSING IODIC ACID AND ISOLATING ITS IODINE.*

BY MM. SIMON AND LANGONNÉ.

Having lately been called on to attend an inquest in a case of poisoning, as was supposed, by laudanum, and after an inhumation of six months, in our experiments our attention was attracted by the constant decomposition of the iodic acid, although we could not detect the presence of any of the substances mentioned by authors as possessing the property of decomposing it, and although we were convinced that the principles of opium did not exist in appreciable quantity in the substances submitted to us.

Being aware of the just importance which chemists attach to this reagent in the detection of a toxical agent so frequently criminally employed, and although we are not yet permitted to publish the report of our analyses (*dated* July 11, 1840), and the considerations which it is our intention to join to it, we hope that you will be kind enough to give insertion to some facts which we think not uninteresting to science.

After having filtered and concentrated the liquids arising from the stomach and small intestines, and from the boiling of the matters contained in them, we tried one portion with perchloride of iron, and another with a solution of iodic acid, in presence of a little starch. The first of these reagents gave a red color; the second, a beautiful blue.

Being thus led to suspect the presence of a preparation containing meconic acid and morphine in the liquor to be examined, we adopted Dr. Christison's process for their separation. By this process, we obtained two liquids, one of which should have contained morphia in solution, and in the state of acetate, and the other free meconic acid.

We then tried different reagents with each of them, and, to our astonishment, we found that both acted in the same manner. Thus, the blue coloring of starch, by means of iodic acid, occurred in the liquid, which ought to contain only meconic acid; and that in which only morphia should be found, was turned red by perchloride of iron, and not blue, as we expected.

Moreover, seeing the deficiency of several characters essential to the elements of opium, and in presence of these unusual phenomena, we were constrained to conclude that the substances which had produced them were other than meconic acid and morphia. Their nature remained to be determined.

As to the red coloration by the perchloride of iron, we attributed it to hydro-sulpho-cyanic acid, which possesses that property, and which is met with in the saliva, and probably in the gastric and pancreatic juices. The investigation of the cause of the decomposition was much longer:—

At first, desiring to ascertain whether it was not owing to some of the agents mentioned by authors, we found that our liquids detected the presence of only acetic acid and chlorine, and salts of ammonia and lime. Now, the latter substances, either separately or together, are not possessed of the property in question. Whence, then, came this deep blue coloration, which was re-produced particularly by the contact of iodic acid starch? From an animal matter from which we could not free our liquids by repeated filtrations, by boiling alcohol, nor by precipitation; a matter which is unknown to us in its essence, but whose action is irrecusable.

Indeed, one of us having by chance taken to the amphitheatre, a portion of stomach, and having boiled it, the liquor immediately colored a piece of starch immerged in one or two drops of iodic acid: recent urine gave the same result: saliva had disclosed

* Extract of a letter addressed to the editors of the *Journal de Pharmacie.*

the same power that all the products of the animal economy and many other azotous bodies possess, as we can demonstrate; a power which we have not seen noticed any where, and which, in our opinion, ought to cause iodic acid to be entirely rejected in medico-legal investigations relative to the presence of opium and its preparations, as every liquid extracted from the viscera, or vomited, produces the effects which we have observed.

ON THE NATIVE NITRATE OF SODA, FOUND IN SOUTH PERU.*

BY A. A. HAYES, ESQ., OF ROXBURY.

The existence of nitrate of soda in Peru has long been known, and the inhabitants of a most arid and desolate region have made it, by simple operations, an important article of commerce and manufacture.

This salt has claims of scientific interest quite equal to those of any mineral hitherto discovered. It indicates to us, who are accustomed to a humid climate, with heavy rain storms, a state of atmospheric dryness, as far removed from our experience as the singular products there deposited are from our own rocks and soils.

During the scientific tour of Mr. John H. Blake, of Boston, a great number of specimens, illustrating the forms and composition of this salt were collected, and I have been enabled to learn some facts from the chemical examination of them, but have to regret that the loss of Mr. Blake's journal has prevented our having a full account of their geological relations.

The nitrate of soda exists in large beds, a few feet below the saline soil, or forming that soil in various places, from Arica on the north and west, to the course of the river Loa on the south. The country is an elevated pampa, having the form of a shallow basin bounded by the coast cliffs on the west, by the higher pampas on the north, by sandstone hills on the east, and the ravines through which the river Loa falls into the sea on the south.

The elevation of the pampa of Tamarugal, in the province of Tarapasa, is nearly 3300 feet above the level of the Pacific.

The western border of coast presents granite, on which the pale flesh-coloured feldspar porphyry, peculiar to volcanic regions, reposes. This rock is doubtless trachyte, and its extent and volcanic character make it one of the most important of known rocks. Imbedded in the soil, and forming extensive tracts, are shells of the same species as those now existing in the ocean. A saline soil and other appearances denote that a long line of coast has been elevated from below the ocean's waters. In travelling north, Mr. Blake found that the pampas were broken by ravines through which the waters from the Cordilleras flow at times. A remarkable feature is disclosed by these ravines: a section always presents a higher level on the north than on the south side, so that each pampa presents a *steppe*, rising as we advance northward. The sandstone hills forming the eastern boundary are of moderate elevation; they contain beds of gypsum, and form the western barrier of another basin, the eastern bounds of which are the Cordilleras.

The pampa is mostly uninhabitable, but spots where water can be obtained, and parts of the ravines are cultivated. Nearly midway between the eastern and western limits of this pampa there exists a buried forest of large trees, mostly of the Algorabo species. The trees are inclined towards the southwest, and the wood is singularly well preserved. Specimens have the color and grain of old mahogany, but are brittle. The gaseous constituents of recent wood seem to have been lost, for although resinous, it burns without flame. From personal examination of the country, east of the sandstone elevations, Mr. Blake concludes that a lake of considerable extent once covered the space between these and the Cordilleras. Numerous volcanic rents now exist among the mountains, and it is probable that the saline matter produced by them was dissolved in the water, forming a lake at the base of the mountains. This lake subsequently broke its barriers, and prostrated a forest then growing where the saline matter is now found. I have carefully examined the earthy matter which is mixed with the nitrate of soda from different parts of the province of Tarapasa, and find that the larger part is composed of fragments of finely powdered shells, the color being unchanged. A brown marl forms the remainder, such as results from the washings of sandstone: these facts I consider as supporting the conclusion of Mr. Blake. The surface of the pampa is mostly sand, clay and saline matter. The latter is composed of sulphate of lime and soda, and nitrate of soda—some parts presents the nitrate of soda at the surface—at others, a few feet below. These salts have all the physical and chemical characters of salts produced by decomposition and separated by evaporation from solutions. The nitrate of soda is found in distinct strata, a thin layer of brown loam separating the parts; it is also found mixed with salt, and forming a small portion of the whole mass. The refining operations are rude and simple. The richest masses of the native salt are blasted or broken and divided into small portions; with these, copper kettles are in part filled, and water, or the mother water

* *Silliman's Journal.*

of former operations, is added and heat applied until a boiling and saturated solution is obtained. The solution is transferred to wooden coolers, where the nitrate of soda crystallizes. The undissolved salt remaining in the kettles is thrown aside, fresh salt being used each time, although not one-half of the nitrate of soda is dissolved. The coolers are emptied after the crystals of nitrate have ceased to form; it is dried, packed in bags, and sent to the coast on mules. The wood used in the operations is transported from a distance on the backs of mules from the borders of the pampa. Of late, attention has been turned to using the altered wood of the buried forest, and some excavations promised a supply. Water is found by sinking wells in some places, below the saline soil. The subsistence of the workmen, drivers, and mules, is mostly drawn from Valparaiso. The quantity of nitrate of soda which exists in various bodies is immense, and in addition it is probable that the saline soil would afford a large supply.

Native nitrate of soda, in fractured masses, has a granular structure, arising from the aggregation of irregular rhombic crystals, varying from fine grained to coarse grained. It is brittle, but yields more easily in one direction, separating into angular parts, resembling loaf sugar closely, in some specimens. Color varies from snow-white to reddish brown and gray. Some specimens have a lemon yellow tint irregularly distributed; specific gravity, 2·290; taste nitrous, with a cooling impression; odor, peculiar, and when warmed resembling chloride of iodine dissolved in water.

Composition of average specimens is, nitrate of soda 64·98, sulphate of soda 3·00, chloride of sodium 28·69, iodic salts 0·63, shells and marl 2·60=99·90.

Mixed with this mineral, I have found nitrate of potash, sulphate of lime, chloride of sodium, iodate of potash or soda and chloriodate of magnesia, the latter imparting the bright yellow tint which some specimens show.

ON SOME VARIETIES OF PEAT.*

BY PROFESSOR JOHNSTON.

Professor Johnston exhibited some varieties of peat from the moss near Paisley, which he stated were illustrative of a transition from the comparatively fresh and vegetable matter to a substance resembling coal, but which he affirmed to be ulmic acid. The author stated, that the same substance might be obtained from peat by digesting it in ammonia, and afterwards precipitating the brown solution by an acid; while, on the other hand, caustic potash extracts another acid, which he proposed to term *humic acid.*

Dr. Playfair stated, that an elaborate set of experiments had been made in Liebig's laboratory last winter regarding the nature of humic or ulmic acid. But the results of these had not been at all satisfactory, for the acid varies in composition from whatever source it may be procured. Thus Malaguti, Spengel, Peligot, and Stein, state the proportion of carbon nearly 10 per cent. different from each other. Even the same acid changes in composition by keeping. The reason appears to be, that it is vegetable matter in a state of decay, so that it is not surprising that results so inconsistent should be obtained by different analysts. The secretions from diseased elms might probably be a definite ulmic acid, but there is no reason for concluding that this is the substance existing in peat. Liebig has shown that peat probably proceeds from the decomposition of woody fibre; and this is occasioned by the oxygen of the air. The compounds resulting from this action can always be expressed in atomic proportions; so that when we find that all the chemists who have examined humic acid have obtained different results, we may reasonably conclude that no definite compound exists. There could be no doubt of the accuracy of the analysis of Professor Johnston, but until the same acid was found in other peats and other substances, it would be dangerous to consider it as a definite body.

* From *The Athenæum.*

ON THE MINERALS IN THE NEIGHBOURHOOD OF GLASGOW.†

BY PROFESSOR THOMAS THOMSON.

The neighbourhood of Glasgow, including Leadhills, is not inferior to Cornwall in the richness of its mineral species. The mines of Leadhills began to be wrought during the reign of James IV., under the name of gold mines; and it is said by Boethius, that he extracted from them a considerable treasure. In the time of James V. Leadhills was a lead mine as at present, and is particularly described by Agricola in his celebrated work *De re metallica.* Besides galena, no fewer than nine species of lead ore occur at Leadhills. These are—

1. Sulphate of lead.
2. Carbonate of lead, analysed by Klaproth.
3. Cupreo-sulphate of lead, described by Mr. Sowerby.
4. Sulphato-carbonate of lead, analysed by Mr. Brooke in 1820.
5. Sulphato-tricarbonate of lead, ditto.

† *British Association;* From *The Athenæum,* No. 677.

6. Phosphate of lead, analysed by Dr. T. Thomson.
7. Cupreo-sulphato-carbonate of lead, analysed by Mr. Brooke in 1820.
8. Chromo-phosphate of lead, analysed by Dr. T. Thomson.
9. Vanadiate of lead, analysed by Dr. R. D. Thomson 1834.

Leadhills also affords fine specimens of blende or sulphuret of zinc, and also of silicate of zinc. The Kilpatrick hills, which bound the valley of the Clyde, from the Stockey-moor to Dumbarton, and also the corresponding but lower range on the south side of the valley, are composed of various trap rocks, among which amygdaloid is pretty common. This rock is so termed from its containing numerous almond-shaped cavities interspersed through it. These cavities are filled up by crystallized minerals, most of them zeolites. These are:

1. Stelite.
2. Thomsonite.
3. Natrolite.
4. Mesolite.
5. Scolezite.
6. Lomonite.
7. Chabazite.
8. Analcime.
9. Cluthalite.
10. Stilbite.
11. Heulandite.
12. Harmotome, or Cross stone.
13. Carbonate of magnesia, at Bishoptown.
14. Dihydrous peroxide of iron, at Gourock.
15. Sulphate of barytes.
16. Calcareous spar.
17. Fibrous sulphate of lime.
18. Arroganite.
19. Wollastonite.
20. Prasolite.
21. Fluor spar.
22. Trehnite.
23. Augite.
24. Amphibole.
25. Felspar.
26. Labradorite, one of the constituents of a variety of greenstone at Campsie Glen and at Gleniffer.
27. Mica.
28. Epidote.
29. Steatite.
30. Iron pyrites.
31. Carbonate of iron.
32. Grey ore of manganese.
83. Kilpatrick quartz.
34. Sulphuret of cadmium; rare, and lately discovered occurring along with Prehnite at Bishoptown. Single crystals are now selling at 10*l.* each.

II. CHEMICAL MANUFACTURES.

Elements of Electro-Metallurgy, or the Art of Working in Metals by the Galvanic fluid. Illustrated with Wood Cuts. By Alfred Smee. London: Palmer, Newgate Street; and Longman & Co.

We have long been desirous of bringing before our readers the science of Electro-Metallurgy, and gladly avail ourselves of the opportunity afforded us by the receipt of Mr. Alfred Smee's work on this subject.

Electro-Metallurgy can boast of no great antiquity as a science, the year 1836 being that in which its first germs were developed in a paper by M. De La Rue. Jacobi, Spenser, Murray, and Mason, may be mentioned as having materially assisted in elucidating this subject. But what little information is contained in the writings of the authors above mentioned is so scattered, that the work now before us, giving, as it does, a connected view of the science, may in truth be considered as the only important contribution and complete exposition of the various and interesting topics embraced within its grasp.

In the first book, Mr. Smee commences with a brief but lucid exposition of Galvanism, and then proceeds to describe the most approved batteries, concluding with a general view of the one invented by himself, which has been employed by him in all the processes described in the present work. It were needless for us to enter, in this place, into any detailed account of this instrument, it being already sufficiently known to the scientific men of this country, and we believe wherever known, as generally approved.

Comparisons have, we know, frequently been made between this and other of the more approved batteries; those, however, who have done so, seem to have lost sight of an important item in all investigations of this nature. This will be sufficiently plain from the following extract, which, as evidencing a laudable impartiality on the author's part, we feel great pleasure in adducing, more especially as we most completely coincide with him.

"Professor Daniell's excellent invention being distinguished by its constancy; Mr. Grove's powerful battery, by its intensity; and my own, by the quantity of electricity developed, and by its simplicity. Neither of these can be regarded as a perfect galvanic battery, for each wants some of the properties of the others; it is to be hoped,

therefore, that every attention will he given to the further improvement of these valuable instruments, until the good properties of each are combined in one. Which of these is at present to be preferred, must depend upon the purpose for which it is required, and the choice must of course be left to the operator. For my own part it affords me much pleasure to see that the platinized silver battery has fully answered the expectations which I formed of it. By some it has been too much extolled, by others too much blamed. It has been the subject of experiments not appertaining to it, such as comparing its intense effects when quantity is its characteristic. Notwithstanding the misstatements on both sides, it has fully stood the test of time, and has been employed by the public in a manner which I had not even hoped." That this is no exaggeration may be inferred from the fact of his having received for it the Isis Gold Medal annually awarded by the Society of Arts.

The second book treats of the apparatus to be employed for the reduction of metals: of the substances capable of receiving the metallic deposit; of the laws which regulate such reduction, and of the reduction of the metals themselves.

As regards the deposit of metal, this may take place upon any conducting substance that is capable of acting the part of the negative metal in the arrangement. Those which can advantageously be employed to receive a deposit of any other metal, are those which are not at all, or only slightly acted upon by the particular fluid in which they are immersed. The laws which regulate such deposit appear to have been arrived at by Mr. Smee, who states them as follows:—

"Law 1.—The metals are invariably thrown down as black powder, when the current of electricity is so strong in relation to the strength of the solution, that hydrogen is violently evolved from the negative plate of the decomposition cell. The term violent may seem to require some explanation, for the metal will be thrown down as a spongy powder, even when but few bubbles are given off in the half minute.

"Law 2.—Every metal is thrown down in a crystalline state, when there is no evolution of gas at all from the negative plate, and no tendency to it. When I speak of no tendency to the evolution of hydrogen, I mean, that either electricity of a much greater tension must pass, or the solution must be rendered of more easy decomposition, before gas would be evolved. The crystals may be small or large according to circumstances to be noticed hereafter."

"Law 3.—To throw down the metals in the crystalline state, we must use a quantity of electricity just sufficient to cause the minutest quantity of gas to appear at the negative plate; in other words, the quantity of electricity passing should cause a great tendency to the evolution of the hydrogen, if it be not slightly apparent at the negative metal. To say that hydrogen should be given off slightly from the negative plate, may lead to error, unless duly qualified, for it is only meant that a few bubbles should adhere to the negative plate, after the action has been continued for some hours, for there should he no farther evolution of gas. In fact, the crystalline state is obtained in the greatest perfection, when hydrogen is just at the point of evolution, but yet none is really given off from the negative metal."

The third book is taken up with the subject of gilding, plating, &c., in the course of which we find much valuable and interesting information; but the fourth is that, the contents of which will most probably interest our readers. Here we find discussed the multiplication of coins and medals, the copying of seals, plaster casts, &c.; the multiplication of crosses, the making of dies from embossed surfaces, the manufacture of moulds from fruits, vegetable, &c., and on the application of Electro-Metallurgy to sculpture and other purposes.

These subjects are treated of in separate chapters, each and all of which are so fertile in illustrations, that we must refer those of our readers who desire an adequate knowledge of the many and vast purposes to which the science and art have become subservient in the hands of Mr. Smee, to the work itself, contenting ourselves only with here adducing some of the most important.

"There are three methods of taking the duplicate of a coin or medal. By the first, a primary cast or an intaglio is made in metal, directly by the galvanic precipitation; hy the second, a metallic cast of the medal is first obtained, either in fusible or type metal; and hy the third, we make the intaglio cast in some non-conducting substance, as white wax, sealing wax, &c.

"To take a primary cast at once from the medal or coin should not be attempted by inexperienced hands, and never by any one from an unique specimen, for fear of any mischance. The process, however, is simple and very valuable, when we desire a very perfect intaglio impression of any coin or medal. The object to be copied is to be coated on the side where we do not require action to take place, with glass varnish, or other non-conducting substance. A very fine wire is to be passed round the rim, and then it is ready to be placed in the metallic solution. The adhesion of the air to the metal is of considerable importance in this case, and the metal should not be allowed to remain a single instant in the

solution before the galvanic circuit is completed."

On the copying of seals our author remarks:—

"Now that seals are nearly valueless, there can be no harm in describing the process for copying them. This is very simple: we first give them the thinnest film of black lead, with a hard brush. If necessary, this may be aided by cautiously applying the most minute drop of spirits of wine, but it should be avoided if possible; for the wax being soluble in alcohol, the seal is liable to more or less injury. A fine metallic wire is now to be heated over a candle, and the hot end placed in contact with the rim of the seal, so that it may adhere. Care must be taken to apply a little plumbago round the point of insertion, so that it may be continuous with the wire. It is then ready to be placed in the solution. This part of the operation is in all respects similar to that required for the mouldings of coins.

"The largest seal, as the great seal of England, or the large seals of the bishops, may in this way with ease be copied, and the smaller are attended with no more difficulty. The operator must remember, that although he is at perfect liberty to copy the Chancellor's seal of the last reign, yet he would be liable to the utmost penalty of the law, if he were to carry on his scientific proceedings upon the great seal of Her Present Majesty."

ON THE APPLICATION OF ELECTRO-METALLURGY TO SCULPTURE AND OTHER PURPOSES.

We consider this chapter so truly interesting, that we have subjoined nearly the whole as written by Mr. Smee. He commences with a remark which, though it disgraces us, is nevertheless true.

"Unfortunately the British public have nearly ceased to patronize British sculpture, otherwise Electro-Metallurgy would be a valuable assistant to that art. The sculptor first makes his model in clay, from which he takes a cast in plaster, and this again serves as a mould, into which he pours his fused metal. This latter proceeding is attended with much trouble, and not unfrequently with great danger, from a risk of explosion. The metallic cast when made, is by no means perfect, as it requires much labour to finish it. The Electro-Metallurgist would obtain a far more perfect cast at once, by simply preparing his plaster, black leading it, and placing it in the solution of sulphate of copper. A wire in contact with the black lead must communicate with the zinc of the battery, whilst the sheet of copper to be dissolved should communicate with the silver.

"For very large designs, an inconveniently large vessel would be required; to obviate this difficulty, the mould, provided it be hollow, might have the separate pieces of which it is made, so joined together by wax or grease, that itself should form the vessel to contain the liquid. Very large batteries ought to be employed by the sculptor, and rather a dilute solution; because, in all probability, the size of the battery will not be proportionate to the immense surface exposed in even a moderate-sized design. The piece of copper, forming the positive plate, should be as large and as close to the plaster-mould as it can be placed, in order that as little impediment as possible may be afforded to the passage of the current.

"The copper may be of any thickness; and its strength and thickness may be regulated as required in different parts, by increasing or diminishing the distance between the plaster and the positive plate of copper. The relative cost of this method of making a bronze figure, over the plan now in use, is perhaps difficult to estimate accurately. By the old plan a bronze figure costs the value of the copper, and the coals required for its fusion, besides the labour requisite to render the metal cast perfect afterwards. By the galvanic method, it would cost the value of the copper + the value of an equal weight of amalgamated zinc + the cost of the labour required to work the batteries — the value of the sulphate of zinc formed.

"From the above statements a rough idea only can be formed of the relative cost of these two methods in practice, and it can only be determined with certainty by very large operations.

"Before bringing this work to a conclusion, I may mention that the application of electro-metallurgy, or the art of working in metals by the galvanic fluid, is not confined to the foregoing subjects; for every kind of object, which can possibly be made in copper by any other method, can also be made by electricity!"

Our limits alone prevent our taking special notice of the fifth and sixth books, the former of which takes up the subject of the electrotype, the latter that of galvanic etching. In these a vast field is open to the lovers of the fine arts, by the easy and almost indefinite multiplication of some of our finest copper-plate engravings, which, according to Mr. Smee, are not more difficult to copy than plain ones; a plate possessing the most elaborate design—the most brilliant conception—the most delicate workmanship—in fact, every thing calculated to render a plate valuable—may be copied with the same readiness—the same fidelity—the same ease—as the plate without any workmanship at all.

In bringing our remarks to a conclusion, we can only express our unqualified approbation of its contents, our admiration of the persevering and never-tiring industry of the author, our astonisbment at the immensity of tbe facts he has accumulated, of the ingenuity he has throughout displayed in overcoming no ordinary difficulties, and of the pains-taking labour by whicb he bas been enabled, not only to lay the foundation, but likewise to build the superstructure of a new science, whose application to the every-day business and comforts of life it is as impossible for us to predicate, as it would have been for our forefathers, a century ago, to have done with regard to the powers and applications of steam. Scientific pursuits, it is said, are incompatible with a just appreciation of the usages and customs of common life; and although we have doubts of tbe truth of this assertion, yet must we allow, that in the general appearance and manner, so to say, of getting up the work, many migbt find an illustration of its applicability. Tbe gilt edges, tbe royal arms, tbe picture on the title-page, and the whole outside appearance of tbe work, put us more in mind of one of the gaudily dressed annuals, or of tbe ephemeral productions of nameless writers, depending more on external sbew than on internal wortb or intrinsic merit, than of a scientific treatise every way creditable to its author.

We presumed that Mr. Smee was not answerable for tbese defects, and consequently looked to the name of that publisher wbo could pursue so heterodox a course as that we are now reprobating. We find the higbly respectable firm of Longman and Co. here standing second to tbat of E. Palmer, 103, Newgate Street; the former we must, we presume, acquit of all blame in the matter, and as regards the latter, we would with our wonted kindness attribute it rather to inexperience. If our memory do not deceive us, this is a very respectable instrument maker, wbo cannot consequently be expected to be quite so well versed in bookbinding as in instrument making or catalogue writing, a specimen of which is given (gratis we of course presume) as an appendix to Mr. Smee's valuable work.

Mr. Smee, we hope, will take these last remarks in the friendly spirit in which they are intended, and should he ere long, as we sincerely hope he will, again appear before the public, we would counsel bim to alter, what, to himself, may possibly appear trivial points, yet whicb bave great influence in prejudicing those into whose hands tbe book may fall.

ON THE SOLDERING OF THE METALS, AND ON THE DAMASKING OF GOLD AND SILVER.

BY M. J. FOURNET.

It is generally admitted in chemistry, that, of all the metals, iron and platinum alone possess the property of being soldered to themselves, without previous fusion. However, when we see two perfectly polished sheets of lead acquire, by simple pressure, sucb an adherence to eacb other, tbat, notwithstanding the imperfection of tbe contact, a weight of several pounds is required for their separation; and that after this disjunction, the surfaces present inequalities, it may be conceived that lead itself may be ranked among metals which are capable of being soldered, with this difference alone, that, instead of requiring a more or less elevated temperature, it possesses, under the ordinary circumstances, sufficient softness for soldering to take place.

Tbis last consideration made me entertain the possibility of treating various metallic powders in such a manner as to bring them into a state of agglomeration, ductility and cobesion, witbout the aid of fusion. I excepted, bowever, the brittle metals, for the blow of the hammer and pressure destroy their aggregation, instead of increasing it. However, circumstances favourable to the cobesion of some of these might be found, since zinc, for instance, may be drawn out in the drawing plate, (*filière*,) at a temperature approaching that of boiling water, and which I once accidentally obtained witb very pure and ductile bismuth by effecting the partial sulphuration of a mass of that metal: if, indeed, my memory do not deceive me, M. Chaudet arrived at the same result by another process.

It is evident that in these operations the interposition of powders, foreign to the metal to be soldered, must be avoided, because tbey would oppose tbe approacb of its particles; tbe formation of oxides during the operation must also be avoided, for the same reason. Iron, for example, is soldered to itself, because it is capable of supporting, witbout being fused, a strong white heat, which allows of the fusion of tbe oxide, which the blows of the hammer cause to rise to the surfaces put in contact. Again, it is for the contrary reason, that the same iron, subjected to tbe action of the flatter (*laminoir*) and retaining a portion of its oxide in tbe interior of its pores, often present a mere bundle of layers, without intimate union, between which the microscope shows a greyisb powder, wbich is notbing more

* *Comptes, Rendus*, December 28, 1841, *No.* 26.

than the interposed oxide, whose presence destroys the cohesion of the whole.

This being settled, I first operated on pulverulent silver, reduced from the chloride by means of sulphuric acid and zinc. This powder, heaped up in a crucible, was submitted to a simple roasting, which made its particles to approach so that they might bear very slight blows with the hammer. This first precaution being taken, I again heated it, and hammered it *de novo*, and so on, so that after a few operations, I obtained a perfectly tenacious ductile and homogeneous bar, which I manufactured into a vase, whose polish bore evidence of its perfect homogeneity. This mode of treatment is an exact repetition of that followed with regard to platinum.

I then tried gold, obtained in powder by means of "*inquartation*" and aqua fortis. The results were absolutely the same as with silver.

Copper should have acted in the same manner, if I could have opposed the formation of the oxide, and I tried the experiment on the metallic powder arising from the reduction of the peroxide, by means of a current of hydrogen. However, I experienced great difficulties, on account of the facility with which traces of oxide are formed, even when operating under carbon. The method which I found most successful is as follows:—

I make in the tube which serves for the reduction, a clot of scarcely the size of a hazel nut; I soak it in oil, and rapidly heat it to redness, by the blow-pipe, then I hammer it with great care; I again soak it in oil, and so on, until I obtain, after much loss, a small prism of ductile red copper, which I then can forge and laminate like gold and silver.

It is evident that oxide of nickel, which is reduced by the slightest contact of carbonaceous vapours, and which the flame of the blow-pipe instantaneously precipitates under the form of a metallic powder, even in the midst of borax, would act like the foregoing metals, and that it would be possible thus to obtain plates of this hitherto refractory metal.

Be it as it may, the easy success of my trials on gold and silver, made me think it possible to obtain a damask (*damassé*) of these two metals, which it is impossible to produce by fusion. For that purpose, I disposed in a crucible, alternate layers of the powders of silver and gold, and the operation succeeded to my desire, by following the same process as for the metals taken separately; but the imperfect method which I have thus described naturally is susceptible of many great improvements. For instance, by the assistance of the hydraulic press, a plate of silver powder might be formed sufficiently agglomerated to sustain itself. This plate might be cut by means of a punch, and the holes filled with gold powder, also agglomerated. A sort of inlaid work would be the result, which might be condensed by alternate roasting and hammering, until the mass acquired the metallic density and cohesion. In this preparation it would be very important to take into the account the contractility of the metals, otherwise there would be solutions of continuity, and cracks. However, we must not be frightened at a few slight cracks at first, for experience has shown me that they disappear under the effects of the hammer and molecular cohesion. It would be possible thus to obtain characters, devices, marbling, and, in fact, any designs whatever, of gold incrusted or damasked in a plate of silver, and *vice versâ*. Indeed, it would be possible to gild silver by this means.

The damask would be more susceptible of variation by polishing the surface of the gold and silver, or by dealing the silver by means of nitric acid, or the gold by means of mercury. The results may be again modified, and colorations may be produced by mildewing (*nillant*) the silver; this operation has succeeded very well with me, by conducting hydro-sulphate of ammonia on to the surface of a plate of silver and by exposing the whole in a muffle to the degree of heat absolutely necessary for effecting the combination of the sulphur and the silver; after which it must be removed from the fire. The mass thus sulphurized is at first tarnished and black, but the laminating which permits the ductility of the sulphuret of silver, soon brings together some of the particles, so that its steel blue colour and its metallic lustre may be rendered evident.

It would also add that, in order to obtain agreeable effects, we must avoid the putting gold in too small masses into the silver, for in that case, it forms an alloy of the two metals, identical with English gold, which, on account of its paleness, is less adapted for the purpose.

For the same reason, the laminating should not be carried too far, otherwise the portions of gold and silver which are combined withdraw from contact and form an intermediate zone, the shade of which is not very agreeable. However, by taking the proper precautions, profit may be made of the property which these two metals possess of incorporating without fusion; for, by afterwards passing the damasked plates through the second water, a first series of dull zones or marbling of pure silver, may be obtained, then a second series of white or pale yellow veins, which, formed by the combination of gold and unattackable silver, remain polished; and in the middle glittering yellow bands of pure gold predominate.

For the rest, I shall be content if the indications here given are sufficient to put our artists in the way of further advances towards perfection, and if they think the discovery capable of some employment.

ON LIGHTING WITH COAL GAS.*

BY M. BLONDEAU DE CAROLLES.

In the midst of the continual progress which all branches of industry have lately made, that connected with gas lighting has remained stationary, and the gas works which now have to light the capital work on the same principles, and are constructed on the same basis as they were when this mode of lighting was first introduced into France.

Without here inquiring into the causes of this fact, it cannot, however, be admitted that this manufacture has attained to the last degree of perfection. The least examination is sufficient to show how many inconveniences the employment of gas is still liable to, which science ought to remove, encouraged, as it is, by the daily development of this new method of lighting.

In studying the subject of lighting by gas, it is by no means difficult to perceive that the decomposition of the coal is imperfect, the purification of the fluid inefficient, its measurement inaccurate, and the regulation of the flame bad. To improvements in these four essential parts of this branch of industry, I have directed my investigations.

The raising of pit coal has not increased in quantity since it has been used for the manufacture. It may even be said that at present it is less than in 1727, in which year Dr. Hales extracted from 158 grammes of Newcastle coal, 180 cubic inches of gas, (340 litres per kilogramme.) Now, only from 230 to 250 lit. per kilog. can be obtained.

One of the obstacles to the improvement of the processes of decomposing the coal arises from the opinion which has always been held, namely, that the quality of the gas diminishes at the same time as the quantity increases, so that such a compensation is established, that we should be content with the quantity obtained, without uselessly seeking to augment it.

This erroneous opinion is founded on a scientific datum:—it was thought that if at a low temperature the coal produced less gas, at least it was almost entirely converted into bi-carburetted hydrogen, a gas of great illuminating power, while at a high temperature, proto-carburetted hydrogen, which is formed in greater quantity, did not produce an amount of light equal to that obtained by means of hi-carburetted hydrogen. This explanation cannot be admitted, since it is known that gases owe their luminous power only to the presence of the volatile products which accompany them and saturate them, and communicate to them, whatever may be their nature, *a certain luminous power.*

According to that, it was necessary in the first place to ascertain the quantity of gas which a kilogramme of coal could produce, in order to discover the point at which to aim in manufacture, and then to determine the circumstances in which the coal should be placed, to be able to approach that limit.

After having demonstrated that a kilogramme of coal is capable of yielding 510 litres of good lighting gas, and that it generally produces but 250, I proved that it was attributable to the bad method of distilling now in use, and that, in order to approach to the number indicated by analysis, it was necessary that the coal should be disposed in thinner layers, and that it should be in immediate contact with the sides of the apparatus, so that its elements, under the action of a powerful heat, might combine under the form of a permanently elastic fluid, for which purpose it should be made to slowly pass through the length of heated surfaces, in order to effect the complete decomposition of the bituminous matters contained in it.

By putting these principles in practice I have been enabled to extract 380 litres of gas from a kilogramme of coal, that is to say, 130 more than in the common way.

The purification of the gas is as imperfect as the decomposition of the coal. Besides sulphuretted hydrogen, from which manufacturers do not always give themselves the trouble of freeing it, contains ammonia and sulpburet of carbon, which have never been removed from it. The lime used in the ordinary purification decomposes the hydrosulphate of ammonia, seizes the sulphuretted hydrogen, liberating the ammonia which mixes with the lighting gas, and communicates to it a disagreeable odour, while it diminishes its luminous power. It was necessary to remove this gas before it got into the gasometers; which I did by using coke covered with a layer of chloride of calcium, both of which substances have the property of absorbing ammonia.

The sulphur which coal contains, acting on carbon at a high temperature, produces sulphuret of carbon which may be rendered less volatile by putting it in contact with sulphur, which it dissolves. A layer of sulphur joined to one of coke, slightly impregnated with chloride of calcium, is sufficient to complete the purification, and to

* *Comptes Rendus*, No. 26. December 28, 1840.

prevent the gas from producing in burning, sulphurous gas, which, mixed with the steam, corrodes the coolers submitted to its action.

Having ascertained that all the instruments now in use for ascertaining the consumption of gas are liable to many causes of error, I sougbt a more accurate mode of measurement, availing myself of new principles. My process is based on the fact that lighting gas is saturated with steam at the temperature at which its combustion is effected, so that we may determine, by absorbing tbis steam by means of substances which have an affinity for water, such as lime, potassa, and chloride of calcium, by the increase of the weigbt of these matters, the quantity of gas consumed. In abandoning the measure of volume for the weigbt, the course adopted in chemistry will be followed, to which science tbe balance has rendered such great services in affording it more accuracy.

Finally I am enabled to regulate tbe emission of tbe gas by means of a very simple apparatus.

NEW APPLICATIONS OF THE GALVANO-PLASTIC PROCESSES.

LETTER FROM M. PERROT TO M. ARAGO.

I have just learned, through a journal, that M. Sorel has announced to tbe Academy of Sciences, that he has been enabled by means of a constant current, to fix, without heat, on iron, a more or less thick and very adherent layer of zinc, and that by this means he has been able to fix several metals on one another.

Consequently I thought it my duty immediately to send to tbe Institute, to be deposited there, some objects bastily collected, which remained from experiments, which I made more than a year ago, on metallic precipitations.

Among the objects contained in the box which I send, there are some experiments on a process of metallic incrustation, which I consider new, and capable of receiving many applications in the arts. I obtained these incrustations by means of galvanic currents, by precipitating a metal of one colour, in the parts corroded by a process analogous to that of engraving by nitric acid, on a metallic piece of another color.

Thus, as it was easy to foresee, the incrustations have all the perfection of the engraving, which serves as a mould, and the imperfection of the incrustation which I send you does not extend to that of the new galvanic methods which I wished to try in engraving.*

* *Comptus Rendus*, No. 26,—Dec. 28, 1841.

III. PHARMACY, &c.

ANTIMONY AND ITS COMPOUND.—PULVIS ANTIMONIALIS.

BY JOHN MACKAY, EDINBURGH.

It is well known that the Pulvis Antimonialis was introduced to our pharmacopœia as a substitute for Dr. James' Fever Powder, than which few medicines have been held in higher repute. Medical practitioners have not hesitated freely to employ this compound, and we have long had the anomalous circumstance of an empirical remedy being used in preference to tbe regular medicament of our colleges. There is no substance in the whole range of materia medica possessing so much singularity in historical relation as antimony, and it may not be uninteresting to briefly examine this metal and its preparation, tbe Pulv. Antimon. Comp.

The ore from whicb antimony was and still is obtained, received tbe name of Stebium from the ancients, hence the symbol S 6, still retained in chemical nomenclature. The first use of the metal is of ancient date, and as its name may testify, was noticed in a remarkable manner. Basil Valentine, a monk, in the belief that it fattened pigs, administered some to his bretbren with the charitable intention of giving them a more plump appearance, but his experiment was attended with fatal results. It may appear singular to learn, that at the present time, the Sulphuret of Antimony given for the above purpose, should be employed in veterinary practice, for giving a smooth glossy surface to the skins of horses. The ancients considered large eyes a mark of great beauty, and accordingly we find the females, using the sulphuret for contracting the eyebrows, thus making the eyes look larger, a practice still resorted to by the Turkish ladies. At this time it was, bowever, considered poisonous in any form, a prejudice, which time, and improvement in chemical manufactures have done away witb, and few preparations are now wielded with greater freedom or with more beneficial results than antimonials.

In the sixteenth century, while the controversy betwixt the Galenical and cbemical sects was raging, and while one party denounced, and the other upheld, the prepara-

tions of antimony; the Council of Paris declared by edict, that antimony was totally unfit for internal administration; and Besnier was expelled the Faculty of Medicine in Paris in the beginning of the seventeenth century, for giving antimony to one of his patients. About thirty years afterwards antimonial wine was by authority publicly received into the number of purgatives, and in 1650, the former declaration was rescinded, and this metal brought into great estimation. In 1720, the disgraced medicine was prized so highly, that the same government, which had punished with such severity those who had dared to use it in practice, actually purchased the secret of the *Panacea Glauberiana*, since called *Kermes Mineral.**

About the middle of the last century, Dr. James introduced his antimonial preparation by prescribing it for his own patients. He at this time gave it the name of *Fever Powder*, which it still retains. The notoriety which it soon gained, Dr. Ure thinks, arose as much from Dr. James's mode of treatment, as from the inherent specific virtues of his powder. At the commencement of the disease he evacuated the bowels by combining some mercurial with his powder, and followed this by giving very large doses of bark.† But although it is generally supposed that Dr. James was the original inventor of his nostrum, there appears to be considerable doubt on the subject. Dr. Paris attributes the discovery of the formula to an Italian of the name of Lisle, which is again contradicted by Dr. Halliday, of Moscow, who in a letter to Dr. Paris, on this preparation, claims the honor for a Mr. McIntosh. Be this as it may, we are certain that the activity of Dr. James's Powder depends upon the uniform quantity of protoxide of antimony found therein. The last two compounds of this metal, deutoxide and peroxide, are comparatively inert, particularly the latter, from its great insolubility in the animal and vegetable acids.

Before proceeding to examine the composition of the Pulv. Antimonial. let us glance at the mode of preparation. The ingredients generally employed are Sesquisulphuret Antimony and Hartshorn Shavings; they are to be deflagrated and afterwards exposed to a strong heat for some time.

The following diagram will perhaps give at one view, the change which the ingredients suffer:—

68 Sesquisulphuret Antimony { Antimony.....44
Sulphur.....24....24 Sulphur dissipated.

400 Hartshorn .... { Phosphate Lime..100
Gelatinous Matter 300....300 Gelatinous matter dissipated.

Then:—Antimony (as above) 44
Phosphate Lime (do.).....100 } ....160 Pulv. Antimonii Co.
Atmospheric air yields oxygen 16

Although the above is the mode generally employed, it differs from the formula lodged by Dr. James in chancery, a copy of which may be found in Dr. Ure's Dictionary, page 171. From the analysis of Mr. Phillips and Dr. Pearson, the quantity of oxide of antimony found in Dr. James's Powder was considerably greater than in the Pulv. Antimon. Co. while they have shewn the latter salt to vary, even when made by the same individuals at different times.

In preparing Antimonial Powder, the heat is not only great, but contiuued for some time: now this must necessarily be the means of producing indeterminate quantities of the protoxide and peroxide, in all probability dissipating portions of the former active compound, and adding a quantity of the latter useless preparation. Mr. Brande has found as much as five per cent. more of protoxide of antimony in one preparation than in another, both made in a similar manner, and seldom two samples giving uniform results. If, however, more attention were paid to the proper exhibition of the potassio-tartrate of Antimony I am inclined to think, that many of the indications of the James's Powder might be had, with a greater degree of certainty, than using the P. Antim. Co.

But to sum up, on this matter, there can be no doubt that there is some secret attached to the preparation of Dr. James's true powder, with which we are unacquainted, which is the more to be regretted, as the high, I may say exorbitant, price demanded for the genuine powder is a serious drawback to its general introduction, and placed within the reach of those only, whose purses can afford to pay sixpence a dose for a medicine weighing five or six grains, and which we have every reason for supposing does not cost the proprietor the *smallest divisible fraction of a farthing.* I have heard it stated that the late Dr. James received a large sum of money from government to communicate the *secret* mode of manufacture; whether this be true or not, we know, that *his heirs* are still enabled to prepare an *uniform salt*, for which we

* Vide *Dr. Paris's Pharmacologia*, page 77.

† Vide *Dr. Ure's Dictionary*, page 171.

have to pay them their own price. The simple fact of 100 grains pulv. antimonialis having been given without injurious results, sufficiently proves, that great difference exists betwixt this, and the true James's Powder.

THE STATE OF MERCURY IN UNGUENTUM HYDRARGYRI, PILULA HYDRARGYRI, &c.

BY CHARLES WATT.

Resumed from No. XIII.

In the further prosecution of our experiments detailed in the last number of The Chemist, we have ascertained to perfect satisfaction, that, of all the numerous articles for which the Pharmacopœia is indebted to chemical science, none are so little understood, or so much the subjects of culpable neglect, and nefarious deteriorations, as the common preparations of mercury, in the formation of which, during the course of our enquiries, we have discovered such infamous and heartless knavery as we hope and believe is totally unknown to the respectable portion of the profession.

We must, however, first proceed with our observations on the state of the mercury in these compounds, in which we have shown that oxidation is totally absent in the ointment, and very partially present in the blue pill: however, not wishing to remain satisfied with those experiments we had made from the samples procured from four of the most reputable establishments in London, we have obtained numerous others, and subjected them to a series of tests, from which we have derived the results which form the basis of our observations on the present occasion.

In procuring metallic mercury from the ointment, we were sometimes perplexed as to the means by which completely to free it from the oily matter, turpentine, &c.,* adhering to it; we therefore adopted the following method, which rendered our efforts completely successful. Having first melted the fatty matter with boiling water, and allowed it to stand till the greater part of it floated on the surface, we poured off the fluid fat, and then boiled the mercury in a dilute solution of soap until the metal collected in one globule. By this simple process we have procured the whole quantity that each scruple contained,† which, when weighed, and compared with the fat, proved that we had obtained the exact proportions of each component as directed by the Pharmacopœia. We now proceed to detail our observations upon this preparation as procured from various houses, both in town and in the provinces.

In many samples, we noticed *extreme lightness* in *weight*, and a *peculiar* and *transparent appearance;* on submitting them to the same processes, as we have described, we readily procured what little mercury they contained, and found it to vary from one to two or three drachms per ounce: we also found that the fat had been colored with indigo and Prussian blue, to give it the appearance of the genuine ointment.‡ We have carefully preserved these specimens, and noted the places whence they were procured, with the full intention, if called upon by any authority, to exert our utmost efforts to suppress such baseness. Let the parties BEWARE!

We now come to notice the results of our experiments on the Pilula Hydrargyri. We subjected this compound to the following processes:—

1st. We put one ounce of it, and four ounces of distilled water into a glass vessel, and applied heat by placing the vessel over a lamp, and allowing the mixture to boil for some time, when we added about two drachms of caustic potassa, in order to soften the vegetable matter in the conserve, without affecting the state of the mercury. We continued the heat until the conserve became quite pulpy, and then added fresh water to thin the liquid; the greater part of the mercury, in its metallic state subsided, accompanied by a small portion of oxide.

2nd. We boiled another sample, of equal weight, for about an hour in dilute sulphuric acid, and obtained precisely the same result as in the preceding case.

3rd. We boiled a third sample of like

* It is a well known fact, that turpentine, sulphuretted oil, &c., have long been in use to effect the union of the mercury with the unctuous matter, and these are the obstacles which we had to remove.

† Whoever repeats these experiments will be satisfied of the facts, and will, even with the naked eye, observe the minute metallic globules formed by the trituration. These, on slight agitation, will soon become one bright mass. The total want of oxidation readily accounts for the difficulty of incorporation, and the eagerness to resort to contrivances which act as intermedia, merely on mechanical principles.

‡ Little does it import whether this is the fraud of the master or of the apprentice; the one deserves the pillory, the other the *birch*. Surely such scamps will, ere long, be punishable by law.

weight in muriatic acid, diluted with an eqnal portion of water; and after this process was continued an hour, but slight traces of chloride of mercury were manifested on the application of chemical tests, and as in the preceding instances, the metallic mercury fell to the bottom of the vessel.

In all our investigations concerning the Hydrargyrum cum Cretâ, we obtained results analogous to those observed in the blue pill. To obtain the mercury, we had only to saturate the chalk with any dilute acid, which, with that substance, forms a soluble compound, and then well wash the precipitate with water. The mercury subsided to the bottom of the vessel as before, and principally in its metallic state, accompanied by a small portion of protoxide, showing, in the clearest manner, by the extreme smallness of its quantities, that this preparation cannot owe its medicinal properties to oxidation.

Any lengthened description of our experiments upon the state of mercury in the Black Lotion, would be a work of supererogation; it is sufficient to say, that this is the nearest approach to a true oxide. But our examinations have proved the correctness of M. Guibourt's observation that it also contains globules of metallic mercury, visible, on pressure, not only by a glass, but even by the naked eye.* In the deposit of the mercury, as obtained by the processes we have described in the medicinal preparations of that metal, the globules are distinctly visible even by unassisted vision.

It may here be inquired whether the mercury in fine division, or in oxidation is required in these predicaments. This question depends entirely on which of these forms medical practitioners intend should be employed; for our own part we contend, that both externally and internally, and particularly the latter, fine division is the better; but if oxidation is intended to be used, let the compound be prepared chemically, and thus at once put an end to the nefarious practices we have here related.

By the preceding experiments which we have now fully laid before our readers, we have clearly shewn that the actions of these preparations of mercury do not result from the oxidation of that metal. Thence it is evident, knowing, as we do, the effects which each of these compounds produces in animal bodies, that when in its metallic state its effects are precisely the same as when it is combined with oxygen, chlorine, or any other agent. This proves that the axiom commonly received in medicine, that metals do not act, either locally, or generally, on animal organs, unless combined with some other chemical agent, is totally fallacious. The reason why mercury is capable of acting thus is at once evident, viz., because it is a fluid and in minute particles; therefore it is absorbed into the system. All other metals being solids, it is quite clear, they can produce no action, either local or constitutional, and therefore must be reduced to some state rendering them susceptible of absorption. It has been remarked by writers that even arsenic in its metallic state, when introduced into the stomach, produces none of these direful effects which its acid or other combinations too soon evince.

It is a fact well worth serious consideration, that those preparations of mercury in which it is combined either with oxygen, chlorine, or any other body, act with most power locally, and are the slowest in producing the specific constitutional effects of that metal, and that such local actions are of a totally distinct character from those which it exerts on the system: while, on the contrary, those preparations in which it is in its metallic state, and finely comminuted, produce little or no local action, bnt are the most speedy and powerful in their general and constitutional operations.

We cannot close our observations on this important subject without a melancholy reflection on the little knowledge acquired by Physicians,* (nay, we might almost say their

* We are of opinion that in this case the mercury is not in the state of uniform suboxidation, as first noticed by Boerhaave, but that one part is oxidated, and another part metallic, and may be separated by agitation under water.

* Much more highly indeed would it advance the credit and reputation of general practitioners, if, instead of seeking to obtain a still further encroachment upon every other member of the profession, he would devote a portion of his *valuable time* to these and other investigations; then we might hope to see in this class a race of Boerhaaves, Harveys and Hunters taking the place in a grade incomparably below mediocrity; for indisputable is the fact, that among them there has not been one whose name is recorded as renowned for the slightest advancement of any one part of medical science, or of any of its collateral branches, even though he is Surgeon (mostly, it is true, without license), Physician, Midwife, Chemist, Toothdrawer, &c. Such attention to serve his profession would elevate him more than can any acts of the legislature, which would best protect the interests of society by compelling him to increase his stock of knowledge, or at once to

total ignorance) of the actions of metals in their various states and combinations, upon animal bodies: viz., what is their "modus operandi?" what set of organs each affects? what metals act locally, and what generally? and whether they enter into the circulation, and by what tests they can be detected? In the case of poisonous metallic substances, it appears clearly proved that their power is confined to local action on the stomach and intestines; for it is well known that the signs after death are those of increased vascular action and even ulceration. These compounds, unless in very small doses, do not appear to pass into the circulation.*

We would call the attention of medical men to a subject of such vital importance, and which involves considerations so eminently connected with the advancement of medical science and the benefit of mankind; but in the fear that they will not, it is our intention, in future numbers of this work, to communicate to our readers the results of our own experiments on the action of metals and their various combinations on different animals, having by frequent experience been brought to the undeviating conclusion, that whatever it is your wish to have done, your wisdom is best displayed in doing it YOURSELF.

REMARKS ON THE HOMŒOPATHIC DOCTRINE OF HAHNEMANN.

BY MR. YOUNG.

(*Concluded from p. 22.*)

Having in the last article endeavoured to prove that the action of medicine is not dynamic, and that when medicines are introduced into the system under peculiar circumstances and in very minute portions, they powerfully affect the vital principle, and produce symptoms unusally severe, as in the case quoted from *The Lancet*; and I would ask if it be not possible that any medicine may be so administered as to produce symptoms equally violent. Hahnemann thus describes the action of these attenuated doses.

"However feeble the dose of a remedy may be, provided it can in the slightest degree aggravate the state of the patient homœopathically; provided it has the power of exciting symptoms similar to those of the primitive disease, but rather more intense, it will, in preference, and almost exclusively, affect those parts of the organism that are already in a state of suffering, and which are strongly irritated and predisposed to receive any irritation analogous to their own. Thus an artificial disease, rather more intense, is substituted in the place of a natural one. The organism no longer suffers but from the former affection, which by reason of its nature and the minuteness of the dose by which it was produced, soon yields to the efforts of the vital force to restore the normal state, and thus leaves the body (if the disease be an acute one) free from suffering, that is to say, in a healthy condition.*"

If, therefore, it be possible to cure disease by means of minute doses of medicine homœopathically administered, without disturbing the secretions, weakening the system, or producing a disease, (which is sometimes more obstinate than the one under treatment,) but merely by an almost inappreciable quantity of a medicament, which gently, and almost imperceptibly arrests the progress of the disease, it surely does not require the eloquence of a Demosthenes to convince a man of ordinary capacity of the superiority of this mode of treatment.

But I am aware that argument is of no avail in such a case; a science like Homœopathy requires no comment; it is not by sophistry that truth is promulgated; let him who doubts try the experiment; let him give homœopathy a trial, and if he fairly tries the experiment according to the precepts of the illustrious German, and the result is not favorable to the sciences—then, and not until then, let him condemn it. I have seen, and therefore do I believe, and were I not convinced, my hand would not have traced these words,—I have seen the most violent paroxysms of pain (as in Tic Dolereux) vanish as it were by enchantment; malignant fevers arrested in their progress; and the slow, but unrelenting monster, Scrofula, subdued; and these effects produced, not by the violent and debilitating doses of the present race of healers, but by the almost infinitesimal doses of homœopathists; I have seen this, I say, and I believe.

The method of preparing the medicines

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merge him into his origin. The Chemist and Druggist's ledgers and day-books are not the companions of scientific research; from such quarters, therefore, hope is vain, and expectation only the sure precursor of disappointment. "*Ex nihilo, nihil fit.*"

* A series of experiments on the lower animals, in order to elucidate this subject, would bring to light many valuable facts well worth the trouble. Dr. John Rose Cormack, of Edinburgh, whose researches on the action of Creosote, variously tried on different animals, sufficiently show his industry and capability, has elicited some important results. We could wish to see the above subjects in hands so fitted for the purpose, and we should have no fear for the results.

* *Organon*, p. 296, cclxxx.

used in disease, recommended by Hahnemann, is as follows:—

"Of homœopathic medicines take one grain of those which are solid (mercury being included among the number, or one drop of those which are liquid); put this small quantity in about a third part of a hundred grains of pulverised sugar of milk, in an unglazed porcelain capsule; then mix the medicine and the sugar of milk together for a moment with a spatula of bone or horn, and pound the whole together during six minutes. The mass is then detached from the bottom of the capsule and pestle during four minutes, in order that it may be perfectly homogeneous, and then rubbed down afresh during six minutes, with equal force: collect the whole of the powder into a body during four minutes, then add the second third portion of the sugar of milk, and mix the whole, for an instant, with a spatula; then triturate with force during six minutes. This is to be once more scraped together during four minutes, and rubbed down again for six minutes, stir the whole together during four minutes, and add the last third portion of sugar of milk which is to be mixed by turning it about with a spatula; then triturate the mass powerfully during six minutes, scrape it together during four minutes, and the whole is to be finally rubbed down for six minutes. After the powder has been carefully detached from the capsule and pestle, put it into a phial, and let it be corked and labelled, with the name of the substance, and the mark, $\frac{1}{100}$, which shews that the substance is in the hundredth degree of attenuation. To carry the medicine to the ten-thousandth degree of attenuation, take one grain of the powder marked $\frac{1}{100}$ prepared as above, add the same to the third part of a hundred grains of pulverized sugar of milk, mix the whole in a capsule, and proceed in such manner, that after having triturated each third portion with force during six minutes, scrape the mass together during a space of four minutes. The powder when thus prepared, is put into well corked bottles, with the figures 10,000 marked upon the exterior, which will shew its degree of attenuation."*

Now the question is—does medicine by this trituration acquire any new or additional power? This, I apprehend, is to be known only by experiment, let any one who doubts it take the 1000th part of a grain of Belladonna for several days, observing at the same time the diet prescribed by Hahnemann, and if he is not convinced of the efficacy of trituration after a few doses, I will consent to forswear the art of Homœopathy.*

Let any one, who is habitually costive, take an homœpathic dose or two of opium, and he will find it produce a regular action of the bowels; or peradventure he may wish to experience the effect of a few doses of mercury, consisting of the 30,000th part of a grain of that metal, let the unbeliever do this; it will perhaps help his unbelief.

The only drawback to the success of this art is the almost universal hostility shewn to it by the members of the medical profession of this country. Homœopathy ought to have been cultivated by them, and rendered a means of alleviating the sufferings of their patients, and of rewarding their own endeavours, but they have unfortunately taken the same umbrage at the name of Homœopathy, as coach-proprietors did at the name of railroads, or the copyists at the sight of a printed book; and their very hostility ought to excite suspicion, the more so, as they do not pretend to controvert the science by actual experiment, but content themselves by calling the founder of it a Fool.

* This is the method of preparing the medicines used in chronic diseases, and is extracted from *Stratten's Notes to the Organon.*

DETECTION OF ARSENIC IN THE HUMAN BODY.†

BY MM. KAEPPELIN AND KAMPMANN.

In order to remedy the inconvenience in the employment of Marsh's apparatus, caused by the loss of a portion of the arsenic of which it is endeavoured to detect the presence, and the presence of steam and air in the gas which is to be inflamed; and in order to remedy the difficulty of decomposing arseniuretted hydrogen, by meaus of heat, when it is desired to operate in a glass tube adapted to Marsh's apparatus, as Berzelius and Liebig recommend, MM. Kaeppelin and Kampmann have given the following disposition to it:—

A straight tube of 0^m 01, fitted in a flask with two tubulures containing zinc; from the second tubulure is a bent tube communicating with a tube, in which is chloride of calcium, and to this tube another is adapted of 0^m 005 in diameter, which is drawn out to a point at the free extremity. The latter tube passes into two holes bored in the middle of a sheet of copper; by this means the tube may be heated with a spirit-lamp for a length of about 5 centimetres.

When this apparatus is to be used, dilute hydrochloric acid is first poured on the zinc. When it is considered that all the air is ex-

† Homœpathic medicines may be procured at Mr. Headland's, Chemist, Clerkenwell.

‡ *Comptes Rendus*, No. 23, 7th Dec. 1840.

pelled the tube is heated to redness; the gas is inflamed at the drawn-out end of the tube, and the absence of arsenic in the agents employed may first be proved.

After this, pour into the flask, by means of the strait tube, 1st, fresh hydro-chloric acid; 2d, some liquid, supposed to contain arsenic; 3d, acid; and 4th, liquid supposed to contain arsenic; and so on.

If there be ever so little arsenic in it, it is collected in that part of the tube of $0^{m}005$ which has not been heated, and at the same time it may be proved that a portion of arseniuretted hydrogen has escaped decomposition, by enflaming the gas disengaged at the drawn-out end, and exposing a porcelain plate to the flame.

ON PRESCRIPTION WRITING.

To the Editors of the Chemist.

Gentlemen,—

I am anxious to draw your attention, and that of others connected with medicine, to a subject which I deem of much importance, viz: the carelessness and ambiguity so frequently manifested in writing prescriptions, which, to say the least of it, is highly reprehensible; I am sure that you will concur with me, that prescriptions ought to be written with great ease and perspicuity, in order to prevent mistakes which might be attended with fatal consequences.

When we reflect on the vast and increasing number of youths engaged in dispensing medicine, it cannot be too strongly urged on the notice of the profession, to write as intelligibly as possible; and, I think, Gentlemen, if the nomenclature of the New Pharmacopœia were adopted, it would be more in accordance with the advancement of medical science, than adhering, as many do, to terms in use half a century ago.

In order to illustrate the necessity of writing prescriptions intelligibly, I may mention a circumstance which occurred to me the other day. A surgeon had ordered a cough mixture, in which were guttæ xviij of *Acid. Prussic.*, not stating the other portions of Mist. Camphoræ. and Aqua, sufficiently plain for me to divine whether be intended it to be a ℥iv, ℥viij, or ℥xij mixture: it was so ambiguous that neither myself nor two medical men could satisfy ourselves—and I have met with many previous instances of a similar nature, and I dare say others can corroborate my statement.

If not too far intruding on your valuable space, I would advert to the actual necessity of the term "Acid. Hydrocianic. dil. P.L." being used on all occasions, in order to avoid Scheele's or other preparations being employed as formerly, and which, there is reason to believe, is even now not unfrequently made use of, although there is such a palpable difference in their relative strength as to incur great danger.

Apologizing for the length of this letter,

I am, Gentlemen,

Yours, respectfully,

Jan. 12, 1841. J. T.

SURPRISING RECOVERY FROM THE EFFECTS OF OPIUM.*

BY JAMES B. HARRISON, ESQ. SURGEON.

The following instance of resuscitation must be allowed to possess much interest, both from the novelty of the method which was adopted to supply the natural movements of the chest, and the extraordinarily depressed state to which the patient was reduced. Though a considerable time has now elapsed since the occurrence of the event, it is impossible to review the circumstances of the case without a renewal of those feelings of astonishment which its happy termination was so well calculated to inspire.

As it is of importance, in cases of an extraordinary nature, that nothing be imputed to inaccuracy in the correct appreciation of facts, or to exaggeration in their details, it is always proper to increase, as far as possible, the testimony of individual experience. The subjoined statement is principally furnished from the notes of a gentleman, who has had many opportunities of witnessing instances of this kind, and to whose strict impartiality the most perfect reliance may be accorded.†

Case. — Caroline Mercy, æt. 32, was brought into the Manchester Royal Infirmary on the 16th of June, 1839, at half-past three, P.M. On admission she was in a state of complete insensibility, so that it was impossible, either by pulling the hair, or pinching the skin, to excite any wincing, or signs of uneasiness; nor was any effect produced by the sudden affusion of cold water. The pupils were contracted in an extreme degree; and the countenance presented that peculiar vacancy, or want of definite expression, which is so characteristic of the influence of opium; the breathing was very considerably embarrassed; the inspirations and expirations being separated by an unusually long interval, and accompanied by slight rattles; the extremities were warm.

As soon as she was put to bed, Mr. Gaskell introduced the stomach-pump, with which he injected and withdrew about a gallon of cold water; but towards the end of the operation, as the breathing became laborious, the rattle louder, and the surface assumed a more livid appearance, he thought

* From *The Lancet.*

† Mr. Samuel Gaskell, the present superintendent of the County Asylum at Lancaster.

it prudent to desist. He accordingly introduced into the stomach about two ounces of the liq. ammoniæ, contained in about as many quarts of water, afterwards removing with the pump as much as could be conveniently withdrawn. Large sinapisms were then placed down the back, but she appeared, notwithstanding, to get gradually worse; the respiration became more difficult, the lividity greater, and the pulse less full, and slightly irregular. Boiling water was now applied to the feet and legs, which had the effect of increasing, for a time, both the power and frequency of the respirations, but the benefit was only of a very transitory kind.

At about a quarter-past four, Mr. Gaskell thought it desirable to assist the respiration by artificial means, and he accordingly proceeded to adopt the following expedient: He placed a large pitch plaster on the abdomen, and by this means maintaining his hold, endeavoured to solicit the usual respiratory movements. This did not, however, give him so much assistance as he had expected, and he was therefore induced to abandon it after a short trial. He then placed a similar plaster on each side of the thorax, by which he was able to command a more decisive effect: he thus, with the assistance of the man-nurse, alternately raised and depressed the ribs, in imitation of the customary actions. This plan was productive of some amendment; the lividity diminished, and the natural muscular efforts were more frequent and apparent; the assistance was adapted as carefully as possible to the indications of nature. In addition to these means, boiling water was occasionally applied to the arms and legs.

At about five o'clock I came to Mr. Gaskell's assistance. At this period the temperature of the body had become considerably reduced, and the conjunctiva had lost its injected character. I remember the patient's appearance was exactly that of a dying woman; and I believe it was the impression both of Mr. Gaskell and myself, that our patient could not survive long. The lips were of a livid colour; the expression of the countenance altogether cadaverous, and the rattle in the throat had become exceedingly loud. Boiling water poured on the legs did not now excite the slightest movement, so that, at this time we were almost disposed to desist from further efforts. The circumstance, however, that whilst our exertions lasted, they were evidently productive of advantage, never suffered us to abandon them for long together.

In pursuing these attempts to maintain the respirations by artificial means, we had finally laid aside the use of plaisters, having our hands placed on the margin of the chest, and our fingers curved round the cartilages of the ribs. Situated on each side of the bed with our faces turned towards the feet of the patient, we could thus easily enlarge the capacity of the thorax by approximating the ribs, at the same time that they were elevated. In expiration the reverse movement could be accomplished with equal facility. By a steady continuance of our exertions, we had the pleasure of seeing a gradual improvement in our patient, and towards six o'clock the pulse had acquired the hard jerk which is commonly felt when the system is under the influence of opium.

Shortly after six o'clock, indications of returning sensation were evinced by occasional spasmodic quiverings of the muscles of the chest and abdomen. These spasmodic movements resembled the actions which usually denote approaching dissolution, with this essential difference, however, that they became more frequent and prolonged at each time that they were renewed.

A little after seven o'clock she raised her eyelids, and, at the same time, her left arm was slightly elevated. By persisting in artificial respiration, and using means to rouse sensibility, such as forcibly striking the face and chest with a wet towel, and applying ammonia to the nostrils, in about half an hour from this period the state of stupor had, in a great measure, disappeared. Instead of lying prostrate on her back, she now lay on her side, and was enabled to breathe without assistance. We then caused her clothes to be put on, and the vesicated parts being dressed she was taken out of bed, and compelled to walk about the room.

It is worthy of remark, that whenever, from fatigue, we were led to suspend our efforts to maintain the respiration, a degree of relapse universally followed; the lips became more intensely livid, the pulsations of the heart more feeble and irregular, and the respirations fewer, and accompanied with a louder rattle. On again resuming operations, the converse was also noticed. When the amendment became decided, and the sensibility returned, the rattle disappeared altogether; and this took place without any mucous expectoration, notwithstanding it was natural to suppose that a considerable quantity of mucus was contained in the air passages. The subject was fortunately very favourable for our manipulations, as the abdominal coverings were sufficiently lax to admit the easy prehension of the chest. Of course the right hypochondriac region, from the situation of the liver, presented more difficulties to the operator on that side of the patient. As far as it could be done, we always waited for the natural indications of the act of inspiration, and paid great attention to regulate our movements in strict correspondence with each other. At the conclusion of our exertions, the cartilages of the ribs were slightly evert-

ed, and the cuticle removed in places hy the unavoidahle chafing of the hands.

June 17. It was found that she had heen kept out of bed all night, which scarcely appeared necessary, and was, indeed, contrary to instruction. She had vomited through the night a light-brown coloured fluid, and complained of shooting pains in the head; the pupils were less contracted; the ahdomen was painful and tender to the touch. She was directed to take linseed tea, and to have a poultice applied to the ahdomen. The state of the pulse was not ascertained, owing to the vesicated condition of the arms.

18. The vomiting had ahated, and the pain in the head was removed, though a feeling of lightness remained. The howels were opened by half an ounce of castor-oil.

For several nights after this period she was troubled with a starting in her sleep, which, however, has been gradually removed by the administration of twenty drops of laudanum, given every night at bedtime. She also suffered much from the condition of her legs, which were severely scalded, especially on the posterior part, where they had heen in contact with the hot water which had fallen on the hed; a superficial slough had formed on the dorsum of the left foot. On taking a full inspiration, she complained of some pain at the sides of her chest, where a degree of ecchymosis was discovered; a slight eruption, also, showed itself on the hack, where the mustard poultices had heen applied. The legs were healed after some difficulty; and, on the 27th of August, she was discharged cured.

The moral history of the case may, in itself, possess some interest; it is briefly as follows:—Her husband, who is a master-plumher, failed about four years ago, since which time he had lived irregularly; a circumstance which caused her to be much distressed and dejected in spirits. About two years ago she left her hushand, and went to live with her mother, with whom she resided until the last two months; she then returned to her husband, who had promised an amendment, which, it seems, he did not keep. She again hecame low spirited, pawned her clothes, and was ashamed to go to her mother.

On Sunday, the 16th of June, she sat down to dinner at one o'clock, when, after a quarrel, she left the house and purchased sixpennyworth of laudanum, at four different shops. She says she ohtained about a dessert-spoonful for a penny, and drank it as she purchased it. She then went to a neighbour's house, and can only recollect feeling heavy, and that she had hrandy given her. She is of feehle frame, and was in delicate health at the time of her admission.

In conclusion, I may ohserve, that I have witnessed the employment of the foregoing method of resuscitation in other cases of suspended animation; and even in those which terminated unsuccessfully, it is prohable that it accomplished all that could he effected hy any contrivance for the purpose. Yet it may he thought premature, without further experience, to pronounce as to its relative advantages. In the mean time, it may, perhaps, he allowed, that hy the mechanical expansion of the chest, we procure a more perfect and equahle dilatation of the lungs than could otherwise be ohtained; and that the ingress of cold air is thereby rendered more gradual, whilst it is less forcible and local in its operation. The action of the respiratory muscles may, moreover, by manipulations of this kind, be more effectually roused from a dormant condition. It must not, also, he overlooked, in estimating the advantages of this plan, that it calls for no lengthened preparation, and does not require the smallest aid from mechanical contrivances, which, however ingenious and valuable they may he, are not always at hand when they are most necessary to be used.

But whatever may he thought of the peculiar merits or demerits of the means resorted to for the restoration of the patient, the case may, at least, he considered useful, in showing us the importance of persevering efforts in the resuscitation of those cases where we have reason to suppose that asphyxia is only attributable to a loss of sensation. It is manifest that where the action of the heart is also destroyed, such attempts would he as unavailing as they would he unscientific; and it is to be regretted that the action of many of the narcotic poisons is of a twofold nature. "But, although the chief agency of these poisons (the narcotic) is on the sensorium," says a valuahle writer,* "yet it is to be observed, that they all appear more or less to weaken, and often may irretrievably depress, the action of the heart likewise, and not merely by reason of their effect on respiration. And although there is one case on record where the fatal effect of opium on the human hody was arrested hy artificial respiration, after the natural had failed, yet, in general, the pulse hecomes so feehle, the skin so cold, and the vital actions in the capillary vessels are evidently so much impaired, and under the influence of large doses of opium, hefore the respiration comes to a stand, that there is little ground for expecting that their fatal effect can often he arrested, even by this means, at so late a period."

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* Vide Alison's Outlines of Pathology, p. 342.

ON THE PREPARATION OF THE PROTIODIDE OF IRON.*

BY T. AND H. SMITH, CHEMISTS, EDINBURGH.

The protiotide of iron has not yet come into that general use which its efficacy, as a medicinal agent, merits, a circumstance probably arising from the great difficulty of obtaining it in a pure state. We have procured specimens of this compound from various sources, and, except in one instance, invariably found that, when dissolved, they yielded a solution of the periodide, with the separation of a large quantity of peroxide of iron.

The protiodide of iron has its elements united by so weak an affinity, and the iron has so strong an avidity for oxygen, that, unless very great care is used in preparing it, to regulate the temperature, and avoid exposure to the atmosphere, part of the iron passes into the state of periodide, free iodine is given off, and another portion of the iron absorbs oxygen from the air, becoming peroxide of iron, which is left undissolved on putting the preparation into water. These changes take place even at common temperatures, unless the iodide is carefully kept from contact with the atmosphere. In order to obtain a real protiodide, we would recommend the adoption of the following method as one which we have found uniformly successful:—

Having, in the usual way, prepared a solution of the protiodide of iron, boil it down in a glass flask, without removing the excess of iron, till the weight of the liquid is reduced to three or four times that of the iodine used. Then filter quickly into a shallow evaporating vessel, or common saucer, which, having placed in a flat cast-iron evaporating basin, surround with an excess of lime,† (the proportion being about a pound and a half for every four ounces of the solution,) placing it so that when it slakes and swells up it cannot fall into the dish containing the iodide. The iron vessel must then be carefully covered with a flat metal plate, and placed on a pretty hot part of the top of a table furnace. When the iodide becomes black and obtains a pretty thick consistence, its state is examined occasionally by dipping into it the point of a spatula. When the water is nearly expelled, the iodide, as it cools, concretes on the point of the spatula into a solid, which is soft and slightly moist in consequence of the presence of a small quantity of water. When in this state it ought to be removed from the furnace, after being swept with a spatula, so as to remove any scum of decomposed iodide from the surface, and the basin, with the cover remaining in its place, wrapped up in several folds of a thick dry woollen cloth or linen towel, so as to retain the heat as long as possible, and allow the iodide to cool very slowly. On cooling it will be found in the form of a black, brittle opaque, and crystalline mass, with a shining fracture. The iodide thus obtained is quite soluble in water, and produces a solution of a pale green colour. As soon as the iodide has cooled it must be broken into small pieces, and rapidly put into very small and carefully stoppered bottles not containing more than one or two drachms each, which must be kept in as cool and dark a place as possible. When the iodide is prepared in a close vessel with lime, as gentle heat is not sufficient to render it anhydrous, from its having such a strong attraction for water, it may be kept for days under these circumstances, and still remain moist, but if pretty sharply heated, and removed before the water is quite expelled in the manner recommended, it may easily be obtained in an anhydrous state without danger of decomposition, except at the extreme edge of the cake of iodide; this part ought therefore to be rejected. We have found that the protiodide of iron cannot be deprived of water by lime *in vacuo* at common temperatures, as under these conditions, the iodide seems to have a much stronger affinity for water than the lime. We have kept the solution *in vacuo* for more than a week, along with a very great excess of lime, without obtaining it dry,—the solution loses water up to a certain point, and then remains wholly unchanged.

* *Edinburgh Monthly Journal of Medical Science, No.* 1. January.

† We some time ago communicated to Dr. Christison our use of lime in the preparation of the protiodide of iron, and are happy to observe that this distinguished professor adopts it in the process given in the last edition of the Edinburgh Pharmacopolis.

MEMOIR ON SUSPENSION.*

BY M. ORFILA.

At the sitting of the Academy of Medicine, Paris, held on the 6th of October, 1840, M. Orfila read a long Memoir on Suspension. He discussed, successively, all the signs which had been given for distinguishing between suspension during life and after death. The characteristic which lately had been most insisted on, was the presence of zoospermes in the urethral canal, but this sign is by no means infallible, for it may be met with under all circumstances, and when death has taken place from other causes

* *Journal des Connaissances Medicales.* Nov. 1840.

than suspension. The congestion, which is remarked in the genital organs is quite mechanical, is not more constant. It has often been wanting in individuals who have hung themselves.

The conclusions of M. Orfila's Memoir are as follows:—

1. No sign indicated by authors as serving to distinguish strangulation during life, from that after death, has of itself sufficient value.

2. When there exists neither ecchymosis, rupture, luxation, nor fractures of the vertebræ, and when there are, on the contrary, traces of asphyxia, it is probable that suspension occurred during life.

3. The probabilities will be greater if ecchymosis be met with in the sub-cutaneous cellular tissue following the course of the cord, a character not produced on the dead body.

4. If some of the ligaments were torn, and if some of the cartilages of the anterior region of the neck were broken, suspension after death should be concluded on.

5. If fractures of the cervical vertebræ be discovered, we may be certain that the suspension was the result of a homicide.

6. If there were a luxation of the first cervical vertebra on the second, it might be affirmed that death occurred before suspension, that is to say, that the anatomical lesion resulted from violence foreign to the suspension.

M. Dumeril related a fact which he witnessed in 1812, at the *Maison Royale de Santé*, to which he was then physician. He had not loug quitted the bedside of a patient when he was told that he was hanging by the rope of his bed. The most prompt assistance was immediately rendered, but without avail. A *post mortem* examination made next day showed a luxation of the first cervical vertebra on the second, pushed so far that the spinal marrow had been penetrated by the odontoid apophysis, and, however, the individual had always touched his bed with his bent knees, and did not seem to have made any effort to kill himself.

It is known that the executioners of Lyons and that of Paris, before the invention of the guillotine, differed in their modes of operation: the one killed by dislocating the first vertebra on the second, whilst the other strangled by asphyxia. It may here also be called to mind that nothing is more easy than luxations of the second cervical vertebra, especially during life. An Italian proverb also calls to mind the nature of the accident which sometimes occurs through the violent motion of sneezing, and which makes those present to say "*Dio ti salva.*"

POWER OF GALVANISM IN CASES OF SUSPENDED ANIMATION.

Mr. W. H. Halse, a correspondent of the *Dispatch*, gives the following description of some curious experiments on the power of galvanism, in cases of suspended animation. Mr. H. thinks if the galvanic battery were used in the manner he described, it would frequently be found successful.

"On Thursday last one of my spaniels whelped, having a litter of thirteen, six of which I took for my experiments. I drowned three of them in cold water, and kept them immersed for fifteen minutes, at which time I took them from the bucket and placed them in front of a good fire. No motion could be perceived in either of them. I then put the front legs of one of them in a jar containing a warm solution of salt and water, and its hind legs in a similar jar, in each of which was inserted one pole of the galvanic battery; the whole were then placed near the fire. The position of the dog being now favourable for operating on, without the necessity of making any incisions in the flesh, I passed a very strong shock through its body; it moved its hind legs. I gave it another shock, which caused its tail also to move. I now passed twenty shocks in quick succession through its body; it moved every limb, its mouth opened, and I was inclined to believe that the dog had actually come to life; but the moment I ceased passing the shocks the dog was as motionless as it was previous to my commencement. Again I continued the shocks, and I noticed that there was more motion in the limbs. Considering, that in proportion to the return of the sensibility, that these shocks would be too powerful for it, I decreased the intensity of them, and passed many hundreds in rapid succession, I continued this for about five minutes, the motion of the limbs increasing as the shocks increased in number. I now ceased; the dog still moved. It was restored to life. I placed it on a warm flannel in front of the fire, and in a very short time it appeared as well as it was previously to its being drowned; it crawled on the flannel, and made the noise peculiar to young dogs.

I now examined the other two dogs which were drowned and taken from the water at the same time that this one was. They were both dead — a plain proof that it was entirely owing to the galvanic fluid that life was restored.

The other three dogs I drowned in warm water, and kept them immersed for forty minutes, at which time all motion had ceased. Two of them I laid in front of the fire, and the remaining one I placed in the jars, as in the preceding experiment.

I now passed a few shocks of weak inten-

sity through the body, but no motion was perceptible. I therefore increased the intensity of them considerably, and gave the shocks in quick succession. Every limb moved, the belly protruded and again collapsed, and the head was raised. At this period I stopped passing the shocks, in order to see if there was any motion in the dog, when not under the galvanic influence; there was none. I again proceeded with the shocks, and having noticed that the limbs moved more rapidly than before, I considered it necessary to decrease the intensity and increase the quantity of electric fluid, which I did, so much as to be just enabled to perceive a slight tremour in the dog. I continued in this manner for about five minutes, at which time I removed it from the jars and placed it on the table. It was alive. In a quarter of an hour it appeared to be perfectly recovered.

The other two dogs (which were not allowed to get cold during the whole of the experiment) were now examined; no motion whatever could be perceived. I tried the effect of galvanism on one of these. I was successful. In one hour after this I operated on the other dog also, but it was in vain. There was no vigour remaining in the vital powers; life had fled.

TREATMENT IN CASES OF, AND EXPERIMENTS ON, POISONING BY ARSENIOUS ACID.

BY M. ORFILA.

At the sitting of the Academy of Medicine, Paris, held on the 20th of October, 1840, M. Orfila read a Memoir on the treatment in cases of poisoning by arsenious acid. He had tried fifty-seven experiments on dogs, with the view of proving the inefficacy of tonic and excitant treatment, and the good effects of diuretics.

Ligature of the œsophagus in dogs is perfectly supported for thirty-six hours, and thus prevents vomiting. Therefore it is possible to study the action of tonics, such as wine, quinquina, and brandy. M. Orfila says that by preventing vomiting after the administration of arsenious acid and tonics, all the animals perished, whilst all have survived when tonics were not administered, and when the ligature of the œsophagus not practised.

The analysed urines have always furnished a great proportion of arsenious acid after poisoning; for this reason M. Orfila considers the administration of diuretics one of the best antidotal measures.

MM. Gerdy and Londe wished that the quantity of arsenious acid swallowed could be exactly appreciated, as well as of that rendered by the urine and by vomiting, and of that exhaled by cutaneous transpiration. They added that, in medico-legal investigations, the viscera, which contain less arsenic than all the other parts of the human body, alone should be acted on.

M. Pelletier reminded the Academy that his father and M. Vanquelin had established the presence of arsenic in all the phosphates.

M. Chevallier thought that the presence of arsenic in our system might be attributed to the use of tinned vessels. Is it not more probable that it is owing to preparing the corn to be sown with arsenious acid, extensively carried on in some parts of France? A single farmer uses several kilogrammes of it per annum.

M. Orfila requested that a committee might be formed from the three sections of Forensic Medicine, Pharmacy and Chemistry, to assist at experiments which he was about to perform in the great amphitheatre of the *Ecole de Médecine*. His request was complied with.*

POISONING WITH ANTIMONY.†

BY DR. LOHMEIER.

Dr. Lohmeier of Schöneheck has related some interesting cases of poisoning with antimony which occurred to workmen employed in the manufactory of antimonial preparations. They were exposed, in their operations, to the vapours of oxide of antimony, antimonious and antimonic acids, and hydrochlorate of antimony.

The symptoms were, slight pain of the head, with tightness of the chest, gradually increasing to pain, and severe stitches, and accompanied with a dry racking cough. To these symptoms succeeded swelling of the cervical glands; burning and lancinating pains at the back of the neck and head; scanty expectoration, accompanied with sibilous râles; nocturnal sweats, and diminished appetite. Diarrhœa, with griping pains, and enlargement of the abdomen, came on, and subsequently stranguary, pains of the testicles, with loss of desire, proceeding to actual impotence, and ultimately shrinking of the penis, and atrophy of the testicles. The symptoms, after disappearing under treatment, broke out afresh, on the individuals being again exposed to the antimonial vapours.

Dr. Lohmeier recommends local bleed-

* We shall give a full detail of these experiments in our next number.—Eds. Chem.

† *Casper's (Wochenschrift*, April and May, 1840,) *and Edinburgh Monthly Medical Journal.*

ings, and the administration of bark, for the treatment, and strong currents of air through the manufactories, for the prevention of the injurious effects to which the workmen are exposed.

NOTICES OF NEW WORKS.

Edinburgh Monthly Journal of Medical Science. Edited by John Rose Cormack, M.D. Edin. Edinburgh : Maclachlan, Stewart & Co. ; London : Whittaker & Co. No. I. January, 1841.

It has long been matter of surprise to us, that in Edinburgh, the seat of a justly celebrated school of medicine—a school from which many of our most eminent practitioners have emanated, there should be no journal of the nature of the one before us. The deficiency, however, is now most amply supplied.

Under the heading of "Original Communications," (the first of the four parts, into which the work is divided), are given several very interesting articles, among which we may mention,—"Surgical Cases and Observations," by James Syme, Esq., F.R.S.E. "On the Pathology of Laryngismus Stridulus," by Dr. Henderson; and "Contributions to Forensic Medicine," by Dr. John Reid.

The second part is devoted to reviews.

The "Periscope" which constitutes the third division, contains articles from various sources, British and Foreign, on subjects connected with anatomy, the practice of physic, pathology, surgery, midwifery, materia medicæ, chemistry, and forensic medicine.

The fourth gives the latest medical news, and in this division it is in future intended to give reports of the transactions of the various scientific societies.

The work is conducted on a most excellent system, and we wish it that success to which the talents of the editor and of the eminent contributors, whose names adorn it, entitle it.

To those whose professional duties engross much of their time, this work will be very valuable, as it will supply a great variety of articles in a very condensed, yet succinct form. As a proof of the great variety displayed in this journal, the number before us contains no fewer than forty-four articles on the different subjects above mentioned.

It is a very valuable addition to the medical periodical literature of the day.

The Student's and Dispenser's Manual; being an Explanation of the principal terms used in the Materia Medica; A Collection of words used in the Medical and Surgical Professions; Tables of Incompatibles, Poisons, &c. &c.; *A Table of Vegetable Substances of the British Materia Medica,* &c. &c. By G. Whitmore. London, 1840.

This Manual will be found of great utility alike to the young and to the experienced medical practitioner. It contains all that is absolutely required in such a work, fully hearing out the announcement in the title; and it has the advantage of being so small that it may be conveniently carried in the pocket. The table of incompatibles alone would render it advantageous to the prescriber.

We feel somewhat surprised at what appears to us the high price of this work, as compared with its hulk; but we think its utility makes up for the magnitude of the charge. We recommend it to our brethren, none of whom should be without it.

MEDICAL REFORM, AS RELATES TO DRUGGISTS.

To the Editors of the Chemist.

Gentlemen,—

Chemists and Druggists generally, and I doubt not most of the respectable members of the medical profession would be glad to have a Medical Reform Bill based on the entire division you recommend in your comments on the bill proposed by Mr. Hawes, and no difficulty would, I think, exist, so far as it regards themselves; but there appears an almost insurmountable one for the public. There are many villages, at least eight or ten miles from any druggists' shop, although probably but a mile or two from a surgeon's. Now, in case medicine should be immediately required in one of these villages, after getting the prescription from the surgeon, two or three hours must elapse before it could be procured, or if it were a poor person without a horse, double or treble that time, which in an urgent case would be a serious inconvenience; and when not an appearance of immediate danger, it would probably, in many instances, prevent till a more convenient time, any application for medical advice. That in other respects it would be a public benefit, I am fully convinced, for certainly, druggists generally are much more particular in dispensing than surgeons, many of whom keeping no assistant, and not being disposed, or not being able, from their constant absence, to superintend the dispensing of their own medicines, it is

left to their apprentices, and not unfrequently to their servants,* to give pills out of such a pot, or even perhaps to put up a mixture.

I cannot conclude without expressing my thanks for the repeated calls you have made upon us to look out for ourselves, and I doubt not, if you can remove the main difficulty in the plan you recommend, petitions for its adoption will flow in.

I am,
Gentlemen,
Yours, respectfully,
A. B.

Colchester, Dec. 8, 1840.

PRESENCE OF ALUM IN BREAD.†

Several families having simultaneously been taken ill, on the fifteenth of last November, in one of the quarters of Paris, Dr. Lefebvre, who was called in to several of these persons, discovered that the cause of the symptoms which they experienced, arose from the bread they made use of. Indeed, analysis detected in it a certain quantity of sulphate of alumina and potassa. This salt has the property of rendering bread more white, and gives it an appearance of freshness which is agreeable to the eye. It also renders the bread more porous, and permits the paste to absorb more water—an evident benefit to the baker. M. Lefehvre has noticed the fact: it is for the authorities to watch over the manufacture of this commodity.

ANTI-HYSTERIC DRAUGHT OF DR. JOSAT.‡

Fifty-five observations, in my own practice, or in that of some of my brethren, enable me to indicate the following solution as being indisputably efficacious in every simple hysterical fit:—

R. Cyanuret of Potassium gram.	0·05
Distilled Lettuce Water . .	60·00
Syrup of Orange Flowers .	20 00

It is administered by teaspoonfuls at intervals of ten minutes, if the fit be not yet manifested, and it almost always is prevented. In the contrary case, however intense the fit may be, it is stopped, or at least, greatly allayed by acting as above. I would observe, that care must be taken to employ the cubic cyanuret of potassium, and not the ferro-cyanuret. Experiment has shown me that the latter is utterly inefficacious.

* And often their wives and children.—Eds. Chem.

† *Journal des Connaissances Medicales.*

‡ *L'Esculape.*

ADULTERATION OF BUTTER.

It has come to our knowledge that various frauds are now carried on in this article to an enormous extent. The practice is thus contrived:—

Butter is sent over from Ireland, mixed, full one half, with bad flour, oatmeal, and pea flour, with a large quantity of salt and water, and is sold in London, Liverpool, Glasgow and Edinburgh, &c. &c. &c.; and thus the public, and especially the poor, are defrauded. The trick is concocted between the Irish factors and our dealers. The samples we have seen are sad evidences of human depravity. We are alive to the scheme, and shall send any samples we may get, when tested, to the source whence are to be expected the remedy of the nuisance and the punishment of the wretches of such baseness.—Editors.

TO CORRESPONDENTS.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

Mr. Alfred Watts's communication does not contain much that is new or useful: we cannot devote *six* columns to it. Next month we may extract anything of sufficient importance.

A Subscriber must inform us what "substance of grease" he means, and he must be altogether more explicit.

A Subscriber, Hull.—One part of mercury and three parts of silver will form a very good amalgam for filling decayed teeth.

We could not decypher the name of the gentleman to whom Mr. A. J. Miles requested us to address. If Mr. M. will favor us with a second letter, it shall have an immediate answer.

If Medicus will enable us to address a letter to him, we will tell him how the information he requires may be obtained: space will not admit of our doing it here.

Answered by Post.—Mr. Arthur Trevelyan, and Mr. J. Mac Swinney.

Communications received from R. G. B.; N.; A. C.; Z.; S. P.; J. N.; R. M.; Mr. Brown, and M.D.

All the numbers of The Chemist are to be had of the Publisher.

A Reader in the Far West is informed that Leeches may be obtained at Potter's, 66, Farringdon Market, at the following prices:—Speckled leeches 1*l.* 2*s.*; Green 13*s.* per 100.

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THE CHEMIST.

I. CHEMISTRY.

INVESTIGATIONS CONCERNING THE TRUE ATOMIC WEIGHT OF CARBON.*

BY MM. DUMAS AND STASS.

When bodies are combined, and when one body is displaced by another, certain numerical relations are observed, which form the basis of modern chemistry. The existence of these relations, recognised by Wenzel, and generalised by Richter, served as a foundation to Dalton's atomic theory, and it has received considerable development from Berzelius's works. The well-known accuracy of the illustrious Swedish chemist might almost induce us to believe that these relations were determined in a manner more than sufficient for the wants and progress of science, at least, so far as regards the most common aud most important ones.

We shall show, however, that there exists an error of about two per cent. in the determination of the quantity of carbon which expresses the proportion in which that body combines with other bodies in nature. This error—one of the most serious, it is to be hoped, that have to be corrected in the tables admitted by chemists—leaves no doubt as to the necessity of carefully revising all the other numbers relative to simple bodies. If these numbers were accurate, as is supposed, the error in that of carbon would long since have been detected; for it would have been made manifest, not only in every-day analysis, but especially in those which Berzelius has recently and with so much care performed, and from which he concluded that the present number for carbou must be retained.

In fact, the question may be reduced to the most simple form, for it consists in asking if, in the production of carbonic acid, for example, oxygen and carbon combine in the proportion of 800 of oxygen to 306 of carbon, as Berzelius says; or in the proportion of 800 to 300, as indicated by us.

Nothing, apparently, is easier to resolve than such a problem. Still, when one reflects on all the consequences which flow from it, one hesitates, in spite of oneself, from a fear of having omitted some precaution; one distrusts one's apparatus and products; and that is the reason why, in an experiment which seems so simple, before publishing a work which has occupied several months, we were obliged to repeat it so often and under so many forms, that certainly nothing similar was ever done in a determination of this kind.

But these precautions will not seem useless, when we reflect that many formulæ in organic chemistry will be greatly modified by this single alteration.

If a chemist found in an analysis, that 100 parts of any substance yielded 3614 parts of carbonic acid, he would conclude, if he adopted M. Berzelius's numbers, that the substance analysed was pure carbon. Now, this substance would contain at least 1½ per cent. of oxygen, hydrogen, or some other body. This error has necessarily been committed in the analyses of anthracite and pit-coal recently published.

In an analysis like that of cholesterine, if 85 of carbon, 12 of hydrogen, and 3 of oxygen be found by calculating according to Berzelius, only 83 of carbon would now be found. Now, if one is not impressed with the importance of a change which reduces the quantity of carbon from 85 to 83, which makes a modification of a fiftieth, it is easy to conceive how serious this change is, when we see that all that is taken from the carbon must be added to the oxygen, which increases the oxygen from 3 to about 4·5—a change which amounts to half of the weight of that important element.

Thus, a body looked upon as free from

* *Académie Royale des Sciences;* Sitting of Dec. 21, 1840. From *Comptes Rendus*, No. 25.

oxygen, would contain it; in another, the proportion of oxygen would he douhled, or at least increased to such an extent that the admitted formula would he completely altered.

It is by this diminution of carbon and increase of oxygen, that we may explain why the analysis of fatty hodies, so carefully performed by M. Chevreul, generally remain accurate, although their formulæ should, in certain cases, he changed.

Certain organic alkalis, several volatile oils, many resins, and some neutral animal matters, will experience analogous changes, founded on the same reasons. We will puhlish in other memoirs the results which we have arrived at concerning these different points, if, however, we be not anticipated.

What stops us at present, is the fear of replacing erroneous formulæ hy uncertain ones. Nothing can be more fatal to the real progress of organic chemistry.

As the Academy has often been occupied with the phenomena of substitutions, it will learn with pleasure that it was the study of those phenomena which led us to discover and to prove the error in question. The formulæ deduced for certain bodies from the old weight of carbon by Berzelius did not agree with the laws of substitution. It was evident that either these laws, or the weight of carhon, must be wrong. The question being once put thus, it became our duty to seek all means of resolving it, and we have neglected nothing which could render the solution faultless.

Indeed, when we submitted to analysis certain bodies which are very rich in carbon,—as the liquid or solid hydro-carbons on which we endeavoured to found the study of the phenomena of substitutions,—circumstances of a strange nature presented themselves.

Every one knows that what is called the analysis of an organic substance consists, as MM. Gay-Lussac and Thenard have shown, in its total comhustion, that is to say, its conversion into water and carhonic acid. The operator therefore knows, by his own experience, the weight of the matter which he studies, and the weight of water or carhonic acid which it yields. From these latter he deduces the carbon and the hydrogen, relying on the composition of the water and of the carbonic acid itself.

Now, when the sum of the carbon and of the hydrogen, which these bodies contain, is made, it is found, going hy the analysis of water and carbonic acid given by Berzelius, that this sum greatly exceeds that of the matter itself. Thus, 100 parts of naphthaline yield 95·5 of carhon, and 6·1 of hydrogen, making in all, 101·6. 100 parts of benzine would be formed of 93·5 of carbon, and 7·7 of hydrogen, making a total of 101·2.

Such results were absurd, but an explanation of them might be sought:—1st, in the method of analysis, which might have been incorrect: 2nd, in the analysis of the water, which might have heen inaccurate: 3rd, in that of the carhonic acid, which might have been the same.

At all events, it was impossible to place any confidence in the analysis of such hodies, or of their derivatives, such serious deviations being capahle of disturhing all the formulæ.

In a report made to the Academy in the name of a committee, charged with examining a Memoir relative to the oils of resin, which MM. Pelletier and Walter had suhmitted to it, one of us proposed to consider these deviations as owing to an error in the determination of the elements of carbonic acid: this opinion was perfectly correct.

Indeed, if we wished to attribute the excess of weight given by analysis to the method of performing that analysis, we have only to make it by other means, to perfect those which are in common use, and we shall very soon be convinced that, so far from diminishing the error, these new precautions do but render it more evident.

Relatively to carhon, the hydrocarbons in question, when they can be completely burned, always yield the same quantity of carbonic acid, whatever may he the process. In ordinary analyses, some carhon is always lost, for reasons which will he given farther on. It is the same with their hydrogen: the experiments have been greatly varied and multiplied, the same cyphers for the quantity of water produced hy their combustion always heing found: the method of analysis, therefore, is not to he hlamed for this excess.

But the composition of water might be ill established. We have made direct experiments in this respect, and they are fully satisfactory. The composition of water, as given by the experiments of MM. Dulong and Berzelius, without heing perfectly accurate, will receive from our experiments only an insignificant modification for the question with which we are occupied.

The composition of carhonic acid, therefore, remained, which it was necessary to suhject to an attentive verification, and thence, we think it our duty to say, all our results, without a single exception, agree in pointing out a serious error, the sole cause of the above-mentioned deviations.

In the meanwhile, M. Berzelius, hearing of the change which one of us proposed, relative to the composition of carbonic acid, hastened to make new experiments on this suhject. Instead of directly seeking in what proportion the carbon comhines with

the oxygen, he preferred to make the analysis of carbonate and oxalate of lead. Now, admittiug that these new analyses were correct, the only consequence that could now he drawn from it would be that the composition of the oxide of lead, on which they were based, was incorrect.

However, these questions must be cleared up, and we will uot shrink from any experiments, however numerous and tedious, to which this necessity of revising the principal analyses, those which serve as the basis of all our speculations, compels us.

Thus do theories proceed, and hence their utility in the study of sciences. Their adversaries may content themselves with doubting facts; it is sufficient for them to say that they do not admit the consequences drawn from them; they are permitted to remain quite passive. Theorists have to fulfil quite another task: it is for them to prove their opinions by facts, to control the facts on which they at first relied, by still more evident ones. Some years ago, it was found that chlorine, in acting on organic compounds, removed their hydrogen, and that it took its place, volume for volume. In order that this rule may be applied to naphthaline or benzine, the first of these bodies, for example, must contain 94 of carbon, and 6 of hydrogen, whilst direct analysis gives 95·5 of carbon. The adversaries of the theory of substitutions have not failed to conclude from this, and with great apparent reason, that a theory which obliges them to admit that a body, in which 95·5 of carbon had been found, contains only 94, should be repudiated, and that seemed to them sufficient. We, on the contrary, being quite convinced that the rule of substitutions is a law of nature, have not hesitated to look for the cause of these deviations, where it existed, in the analysis of carbonic acid, and experiment has shown us to be right.

This proof was decisive: for, hesides its having the authority of MM. Dulong and Berzelius, the analysis of carbonic acid is not an isolated fact in science. It is in accordance with the densities of carbonic acid and oxygen; it is connected with the densities of nitrogen and air; it relates to the density of all the carburetted gases, that is to say, that the admitted densities of most known carburetted gases may he modified by the single fact, that the analysis of carbonic acid is inaccurate, if Mariotte's law be true; for, admitting M. Despretz's experiments on this subject, the gases beiug uuequally condensable hy the same pressures, it would result that their densities are no longer in direct proportion to their chemical composition, and hence all the densities of gases which have been determined hy calculation must be abandoned, and those furnished by experiment alone retained.

Every one will comprehend what infinite care we must have taken, and what attention we must have paid to an experiment so important—so decisive.

It was necessary, either to renounce the theory of substitutions; to see in its consequences so well confirmed by experiment, a series of chances or errors, without example in science; to forget all that is past, and shut our eyes to the future which these new ideas opened to us;—or to admit that MM. Berzelius and Dulong were mistaken in the analysis of carbonic acid; that there was an error in the densities of the oxygen and carbonic acid, or in the too general application of Mariotte's law. It must be supposed that almost all organic analyses were wrong, and that they had led to true formulæ only hy compensations for errors. It was no longer permitted to us, indeed, to believe in the precision of $\frac{1}{2000}$ which M. Berzelius considers he has attained in the study of the proportion according to which the principal hodies of nature combined, for these proportions, as he has given them, would he found to agree with the determination relative to carhon, which presented an error of $\frac{1}{50}$.

Thus it became our only alternative to repudiate the theory of substitutions, or else to render doubtful the principal elements of the physical study of gases, as well as the bases on which all our atomic tables are founded. It will explain why the method which we have preferred does not require to be based on any numerical determination independent of experiment itself.

Hitherto indirect methods have been more particularly relied on for ascertaining the proportion in which oxygen and carbon combine. Sometimes it was obtained by the analysis of the carbonates, and sometimes, from the comparison of the densities of oxygen and of carbonic acid. In the first case, we were liable to error from operating on impure carbonates, for nothing is more difficult than to procure these salts pure and dry, and we were forced to consider the analyses of their oxides absolutely accurate. In the second case, we had to encounter difficulties of every kind, which, without speaking of the uncertainty which hangs over Mariotte's law, and the true coëfficient of the dilatation of gases, may be referred to the impurity of the gases, to the uncertainty attending the observation of their temperature, and to the hygrometric state of the glass of the vessels containing them, &c. We have preferred a simpler and more direct method.

We hurned a known weight of pure carbon in oxygen, and weighed the carhonic acid thus formed. We made three series of experiments: the first, on natural graphite from the collection of the *Jardin du Roi*; the second, on artificial graphite ex-

tracted from a ferruginous mass, from a high furnace; the third, on the diamond.

The graphite which is purest in appearance requires a long and complicated treatment, if it be wished to free it from every oxidizable body. The following is the process which seemed best to us :—

To free it from earthy matters, it is heated to redness, with potassa: the mass is moistened, and the remaining graphite is plentifully washed with water. It is afterwards boiled in nitric acid and *aqua regia*, to free it from iron and bases. Finally, this graphite is exposed to the action of a current of dry chlorine and to an almost white heat for twelve or fifteen hours. It is surprising that products which have been boiled for a long time with *aqua regia*, should still yield chloride of iron by this means, for many hours. This, however, is the case.

Thus prepared, the graphite still contained here and there, perfectly colorless, sandy grains, which must be taken into the account, in weighing after the combustion. Besides, the different agents employed having corroded the lamellæ of graphite, the latter became capable of condensing air or moisture. Before each weighing, the matter must be burnt to redness, and allowed to cool under a bell glass, beside a vessel containing sulphuric acid. This weighing requires much attention: it was especially to obviate the causes of error inseparable from this operation, which, apparently is so simple, that we resolved on burning the diamond.

But we could not confine ourselves to burning small quantities of that precious stone, as all who have studied the combustion of the diamond have done. They had all investigated what the volume of oxygen gas became when converted into carbonic acid by the combustion of the diamond, which is much the same as comparing the respective densities of carbonic acid and of oxygen.

On the contrary, we wished to determine what weight of carbonic acid would result from a known weight of diamond; this simple and absolute method was the only one which could lead us to the discovery of the two proportions which we sought.

This experiment required the sacrifice of ten or twelve grammes of diamond, that is to say, an expence which at first made us hesitate, and which engaged us to reserve a portion of the diamonds, in order to repeat before such of our brethren as might feel some curiosity on the subject, our own experiments, or any other experiments they might wish.

The kindness of MM. Halphen, who furnished us with these diamonds at the lowest possible price, permitted us to select samples from large quantities, as to make some accessory observations which to be completed would require the assistance of persons better versed than ourselves in the study of minerals, and especially in the microscopical study of them.

All the diamonds that we burned left a residue—an ash, if we may so speak. This residue consisted, sometimes of a spongy matter of a reddish yellow tint, sometimes of yellowish straw-colored crystalline parcels, and sometimes of colourless, crystalline fragments. Although these residues have already been made the subject of an attentive examination by ourselves and by M. Elie de Beaumont, we will not say any thing concerning their nature until a more complete examination has put it beyond doubt.

That portion of the diamond which is not pure carbon, does not consist of parcels adhering to the surface of the burnt crystals or mixed with them. We have found the same residues in the combustion of very large crystals, well brushed, and boiled for a long time with *aqua regia*.

These mineral matters belong, therefore, to the crystal itself; they have been enclosed within its own plates at the time of their formation, and from their precise determination arises, as an inevitable consequence, the accurate knowledge of the geological situation of the matrix of the diamond, nature having deposited in the very crystals of this beautiful substance, the certificate of their origin, so long and so vainly sought after.

The question thus looked on is so worthy of attention, that it has in no small degree contributed to make us put forward all the means necessary for treating it to the uttermost. By choosing and studying with attention the diamonds which we still intend to burn, the question may still be resolved.

From their diverse aspect and their general nature, it might be foreseen that these ashes of the diamond would vary in their proportions. We have found at least 1 part of them in 2000 of diamond, and sometimes 1 in 500. We do not doubt that the purest diamonds, those whose color and transparency leave nothing to be desired, may burn without residue. But the rough or cut diamonds, which we chose on account of their cheapness, all left some appreciable mineral matter. We have most frequently operated on that class of diamonds which is unfit for the wheel, which lapidaries call *natural* diamonds, and which cannot be polished.

When we operated on graphite, we made use of a very simple process of combustion. The graphite, contained in a platinum tray, was placed in a very hard glass tube of a metre in length. Behind, was a mixture of oxide of copper and chlorate of potassa,

to furnish oxygen; before, pure oxide of copper strongly heated, and thus fitted to destroy all the oxide of carbon which could be produced.

Combustion was readily effected by these means, but the condensation and consequently the weight of the carbonic acid formed would have left us much uneasiness, if we had not had at our disposal the excellent process which M. Boussingault applies to the analysis of air, and which allows the least trace of carbonic acid or water to be appreciated. This process consists in passing the gases through tubes, filled with small pieces of pumice-stone, moistened with sulphuric acid, when it is required to retain water, and with potassa when it is required to absorb carbonic acid. After having thus been filtered through the pores of the pumice-stone thus prepared, the gases pass out perfectly free from water or carbonic acid.

Our first experiments on the combustion of graphite were executed by this method. However, when we afterwards wished to proceed to the combustion of the diamond, we felt some fears. Would the temperature which our tubes could bear be sufficient for burning the diamond? Were we not liable to lose some of our experiments by those defects so common in glass tubes, which cause them to break or to fuse? Were we quite certain of avoiding the presence of external humidity in an apparatus which it was necessary to arrange afresh for each experiment?

All these considerations decided us to make use of gaseous oxygen passing through a porcelain tube, in which the carbonaceous matter was heated to incandescence. The arrangements were so well made, that not only were all the experiments performed as preliminary studies concerning graphite perfectly in accordance with one another, but we had also the extreme satisfaction of seeing the success of the five combustions of the diamond which we executed, without the slightest accident.

In this new disposition of the apparatus, the carbon was introduced into a porcelain tube through which might be directed at will, a current of pure and dry oxygen. On leaving the apparatus, the gas passed through condensers which detained the carbonic acid and allowed the excess of oxygen to pass off. Some precautions were necessary, and they have formed the subject of a long and minute examination.

At first it was necessary that the oxygen should be entirely freed from carbonic acid. To this effect, it was collected in milk of lime, and made to pass into the same apparatus, by displacing it by aid of lime water poured in drop by drop. Besides, the gas passed through a tube of 1 metre in length, and 3 centimetres in diameter, full of pumice-stone saturated with liquid caustic potassa.

In order to deprive the gas of water, it was passed over pieces of solid potassa, then over pieces of glass covered with sulphuric acid, and finally into a tube of a few centimetres in length filled with pumice stones in grains, moistened with boiled sulphuric acid.

These precautions taken, we were able to pass a rapid current of gas through the apparatus for fifteen hours, without the tubes which were added to it, and which were capable of absorbing carbonic acid or water, experiencing the slightest alteration of weight, which was appreciable to a balance sensible to a milligramme.

Consequently, we were sure to find the least traces of water which might be formed at the expence of the hydrogen belonging to the carbonaceous matter which we proposed to burn.

It remained to be ascertained that we could gather without loss the whole of the carbonic acid formed. A few experiments gave us the most entire conviction that its condensation might be complete. Indeed, in adjusting to the tube in which the combustion is effected, a condenser filled with concentrated liquor potassæ, the greatest part of the carbonic acid was retained, namely, about 99 per cent. The small portion which escapes is, it is true, most difficult to collect, because it is mixed with a great quantity of oxygen, which prevents its absorption. However, it was easy for us to convince ourselves by passing the gas successively into five U tubes, from 30 to 40 centimetres long, and full of pumice stone moistened with liquor potassæ, the three last did not change weight during the whole experiment. Almost all the carbonic acid which escaped from the condenser remained in the first U tube; the second gained but a few milligrammes in weight.

Thus when the gas goes out of the porcelain tube in which it served for burning the carbon, it is sufficient to pass it into a tube containing pumice stone moistened with sulphuric acid, to deprive it of water.

As for the carbonic acid, to absorb the whole of it, a condenser full of liquid potassa, two U tubes filled with alkalised pumice stone, and an U tube filled with sulphuric acid, to free the gas from the water which it may have acquired from the potassa itself, are all that are necessary.

These preliminaries settled, we devoted ourselves to the combustion itself.

To avoid all production of carbonic oxide, we have added a precaution to those which have already been mentioned. In the free part of the porcelain tube into which the gases pass after the combustion of graphite, we placed copper turnings; then, heating

the tube to redness, we directed into it for sixteen hours a current of air, to which succeeded a current of oxygen for the same time. The oxidation of the copper being thus completed, we proceeded to our combustions, with the conviction that the least traces of carbonic oxide would be converted into carbonic acid by passing through this sponge of incandescent oxide of copper.

We went even farther, when it was required to burn the diamond, for we passed the gas which left the porcelain tube, through a long tube of hard glass, full of oxide of copper, heated to redness.

All these precautions being taken, fifteen or twenty quarts of oxygen were passed into the apparatus, but without putting either diamond or graphite in combustion, not the slightest trace of water or carbonic acid is obtained.

After having circulated oxygen in the apparatus, air must be circulated, with the same precautions. The tubes remaining full of oxygen, and their liquors being saturated with it, they gain an excess of weight which they lose after the passage of air—returning to their primitive weight. This precaution was taken in all our experiments.

The apparatus being thus arranged and tried, one of the ends of the porcelain tube is opened; the tray containing the matter to be burned is pushed in, it is again closed, and the experiment commences.

At a little below red heat, the natural graphite of Ceylon, on which we operated, burns brilliantly. The oxygen which passes off is almost entirely converted into carbonic acid, while there remains any graphite in the tray. It is not thus with artificial graphite; its combustion is much more difficult; there passes off during the whole experiment a mixture of oxygen and carbonic acid, where free oxygen abounds.

These two varieties of graphite give the same results. At first they did not contain any appreciable trace of hydrogen. It often happened that the tubes destined to condense the water did not vary in weight: sometimes they had gained a milligramme. Neither natural nor artificial graphite, therefore, contains any hydrogen. As for the carbon, we will show by an example, how great an error we had to correct. In an experiment where 1471 of artificial graphite were burnt, 5395 of carbonic acid were collected. If we calculate how much carbon this carbonic acid contains, according to M. Berzelius, 1491 would be the result. It must, therefore, be admitted that there is a mistake of 20 milligrammes in weighing the graphite with a balance sensible to a quarter of a milligramme. If, on the other hand, we calculated how much carbonic acid the 1471 of graphite ought to have yielded, according to M. Berzelius, it is found to be 5315, that is, 81 milligrammes less than we had obtained. Now it is impossible to admit any error in this weight beyond one or two milligrammes.

According to our experiments on the combustion of graphite, natural as well as artificial, 800 parts of oxygen combine with 300 of carbon to form 1100 of carbonic acid. It is, therefore, 8 of oxygen to 3 of carbon.

If we wished to follow the established custom, we might say, taking the mean of nine experiments which we have made on the combustion of graphite, that the proportion is not exactly that of 8 to 3, but rather of 800 to 299·93.

We have already said whence it comes that the relation between oxygen and carbon, really being as 8 to 3, is not however absolutely obtained by means of graphite; it is because graphite is very difficult to weigh accurately. If it be weighed when warm, it does not contain air, but the balance is interfered with by the currents of air which it causes. If it be weighed while cold, it retains two or three milligrammes of air or moisture. We have tried all means of obviating this difficulty, without being fully satisfied.

As the diamond is not porous, we were enabled to obtain a degree of accuracy in our results, not afforded by graphite. In five combustions of the diamond, three gave the proportion of 8000 oxygen to 3000 carbon. The two others deviated from it only in a very trifling degree.

The first time that we burned the diamond, we had it weighed by a person who was a stranger to our experiments, we remaining ignorant of its weight. We acted on pieces of diamonds as much to try the apparatus as to make a precise experiment. The combustion finished, we found 2598 of carbonic acid, and we concluded that the diamond burnt had weighed 708 milligrammes. At the declaration of this the person who had weighed the diamond was much surprised; she had put 717 milligrammes in the tray. We told her that she would find nine milligrammes residue in the tray, and it actually did contain 9 milligrammes of pieces of Brazilian topaz.

It was to avoid these accidental mixtures, that, in our other experiments, we always operated on large crystals, and perfectly recognised as diamonds by M. Halphen. Thus this accident has not again occurred.

But in our first experiment, we were surprised at the extreme facility with which the diamond burned; it showed itself to be more combustible than artificial graphite. We thought that this might depend on the

division of the small pieces of diamond employed: we were mistaken.

In burning four or five large crystals, the formation of carbonic acid is so rapid that all the oxygen is converted into carbonic acid. Under the same circumstances, artificial graphite would allow at least one-third of the oxygen to pass off without burning.

This ready combustibility of the diamond has occupied much of our attention. The artificial graphite compared with it had, it is true, supported the heat of a high furnace, but no one would have supposed that it would resist combination more than the diamond itself.

This circumstance has given rise to doubts relative to the presence of hydrogen in the diamond.

Some of our experiments have been directed towards this point, and we can most positively affirm that the quantity of water resulting from the combustion of 1500 milligrammes of diamond is not appreciable by a balance which is very sensible to a milligramme. The diamond, therefore, cannot contain $\frac{1}{12000}$ of hydrogen.

However, in weighing the diamond and the carbonic acid resulting from it, we found by experiment that the oxygen and carbon combine in the proportions of

8 : 3,
80 : 30,
800 : 300,
8000 : 3000.

So far we are within the limits of the experiment, without going out of simple relations; but another cypher gives.

80000·30002.

Let us be careful, however, of substituting this more complex proportion for the other, for to this extent we can no longer make the weights answer, either of the diamond or of the carbonic acid itself.

The following is a table of all our experiments:—

COMBUSTION OF NATURAL GRAPHITE.

Graphite employed. gr.	Carbonic acid obtained. gr.	Proportion between the Oxygen and the Carbon.
1·000	3·671	800 : 299·5
0·998	3·660	800 : 300·5
0·994	3·645	800 : 299·9
1·216	4·461	800 : 299·8
1·471	5·395	800 : 299·9

COMBUSTION OF ARTIFICIAL GRAPHITE.

0·992	3·642	800 : 299·5
0·998	3·662	800 : 299·7
1·660	6·085	800 : 300·1
1·465	5·365	800 : 300·5
Mean		800 : 299·93
Atom.		74·982

COMBUSTION OF THE DIAMOND.

0·708	2·598	800 : 299·7
0·864	3·1675	800 : 300·0
1·219	4·465	800 : 300·4
1·232	4·519	800 : 300·0
1·375	5·041	800 : 300·0
Mean		800 : 300·02
Atom.		75·005

In taking account in the weight of the diamond, of the weight of air which it displaces, and in that of condensed carbonic acid which it also displaces, these proportions were not altered.

As oxygen manifestly combines with carbon in the proportion of 8·3, it would, perhaps, be as well here to discuss the reality of Dr. Prout's law. That learned English chemist admits that the proportions according to which simple bodies combine together, are expressed by numbers, all of which are multiples of hydrogen, by an entire number. Thus, 1 part of hydrogen would combine with 8 parts of oxygen to form water, and with 3 parts of carbon to form carburetted hydrogen, or marsh gas. Our experiments fully confirm this remark, to which we will recur, when more extended investigations have enlightened us concerning the extent to which it may be used.

In presenting to the Academy our results relative to the combustion of carbon, we could have wished also to acquaint it with our investigations concerning the atomic weight of carbonic acid and oxygen. The delay which we are forced to make in this communication does not require explanation to persons who know the difficulties of this kind of experiments: we hope, however, to overcome them, as will very soon be seen.

From the above it results that the hydrocarbons to which formulæ were given by the theory of substitutions should retain their formulæ; but it also necessarily results that their ponderal analyses were false when they agreed with these formulæ.

M. Berzelius having admitted that carbonic contains more carbon than it really does, the true formulæ of bodies would in most cases have been wanting, if the superfluity of carbon had not been lost in the calculation.

This loss of carbon occurs in four different ways, and it would be surprising that they have not been before remarked, if the compensation which we have just indicated, had not blinded chemists on this point.

When an organic analysis is made, the matter is burned with the assistance of oxide of copper. The water formed is collected by means of chloride of calcium, and the carbonic acid by means of an aqueous solution of potassa; a little air is then driven through the tubes in order to make all the

water and carbonic acid pass into their respective condensers.

Carbon is lost in this process:—

1st. Because, whatever care may be taken, some of it is deposited about the tubes, which, for want of oxygen does not burn:

2nd. Because the reduced copper is partly converted into carburet of copper:

3rd. Because the liquor potassæ allows some of the carbonic acid to escape:

4th. Because the air which is made to circulate through the apparatus, attracts water from the potassa and diminishes its weight.

This is the reason why the error concerning the composition of this acid has so long remained unperceived. That which was added by calculation was lost on the other, and the analyses seemed excellent, although in reality they were very faulty.

In order that organic analysis might possess all the precision which the investigations that remain for it to accomplish require, the methods of conducting these analyses stood in need of being greatly modified. We have arrived at accurate and always uniform results, by the following process:—

1st. We triple, at least, the quantity of matter ordinarily employed:

2nd. When the analysis is finished we pass into the tube a great quantity of oxygen, in such a manner as to burn all the carbon deposited, and to reoxidize the copper, which frees it from carburet of copper:

3rd. To collect the water, we employ a tube of chloride of calcium, accompanied by a tube containing pumice-stone charged with sulphuric acid.

4th. To absorb the carbonic acid we used an apparatus containing liquid potassa, followed by a tube containing moistened potassa on one side, and dry potassa on the other; the dry potassa attracts any water with which the gas may be charged.

After having disengaged the oxygen, dry and pure air is passed into the apparatus, in order to free it from the atmosphere of oxygen which would increase the weight of the tubes.

In making by this process, which is of an absolute precision, the analysis of the same matters, we always obtain the same numbers, with such slight differences that a like precision is very far from ever being obtained.

A few examples will show, besides, how serious were the errors committed in the former analyses.

In naphthaline was found 94 of carbon; we found 95·5:

Benzine, which furnished 92·3 of carbon; it gave us 93·5:

In camphor, which contained 79·2, we found 80·2:

Benzoïc acid, in which we found 69·2, yielded 69·8; and so on with all very pure acid and well-defined bodies which we have analysed.

In making an accurate analysis of any organic compound, a complete difference would be found between the calculation and the analysis, if the composition of carbonic acid admitted by Berzelius be adopted. This difference no longer exists when the above-mentioned results of the composition of carbonic acid are employed.

By the mode of analysis which we have just described, the determination of the hydrogen acquires such extraordinary accuracy, that the cypher may almost always be regarded as absolutely correct.

The two objects which we proposed to ourselves, are therefore attained. We are certain of the composition of carbonic acid, although beyond what our most delicate investigations require. We possess a process by means of which organic analyses can be made with absolute precision.

The new field for study which these investigations opens to us, remains to be explored; we shall do so with all the ardor which the certainty of being useful to the progress of science inspires; and, nevertheless, with all the reserve which the importance of the questions imposes, and which are, indisputably, some of the most important that natural philosophy can attain to, for they touch on the true nature of the reputed simple bodies.

ANALYSIS OF THE WATERS OF THE AFRICAN COAST AND RIVERS.

The Lords of the Admiralty lately transmitted to Professor Daniell, of King's College, eight bottles of water taken up in the rivers and on the coast of Africa, with a request that he would analyse them, and report as to their effects on the copper sheathing of ships, of which they were found to be especially destructive. During these investigations some very curious and unexpected results came out incidentally, tending to show the probable cause of the miasma, which has such destructive influence on that coast—results especially interesting at this moment, when the Niger Expedition is just about to leave our shores:*

"The most remarkable circumstance, (says Professor Daniell), disclosed by the analysis of these waters, is the strong impregnation of the majority of them with sulphuretted hydrogen; which, in the case of the water from Lopez Bay, amounts to almost as much per gallon as in the Harrow-

* From *The Athenæum.*

gate waters. The proportions of the saline contents do not differ materially from those which are usually found in sea water.

"The extraordinary presence of this gas would naturally lead at first to a suspicion that it might arise from some change which had taken place in the waters after they had been bottled, from the decomposition of some animal or vegetable substance, but this suspicion is inconsistent with facts. On the other hand, it is difficult to conceive how such a striking and important fact as the impregnation of the waters of the ocean, upon such a long line of coast, with this deleterious gas, could so long have escaped observation. It is highly desirable, in many points of view, that its existence should be substantiated, and the limits of the phenomenon both along the coast and in the ocean, ascertained by further evidence. Its effects upon the copper sheathing of ships cannot fail to be highly injurious, and a question of still higher interest even arises, whether this deleterious gas may not contribute to the well-known unhealthiness of the coasts, from which these waters are taken.

"Upon searching for evidence of a similar phenomenon having been observed before, I have found in the Philosophical Transactions for 1839, a memoir of the late Dr. Marcet, 'The specific gravity and temperature of sea-waters, in different parts of the ocean, and in particular seas, with some account of their saline contents.' Out of sixteen specimens which he examined, he found one which was brought by Captain Hall from the Yellow Sea, in the Chinese Ocean, which from the account he has given, must probably have been as highly charged with sulphuretted hydrogen, as those which I have just examined from the coast of Africa; and he observes, 'there is something in the development of sulphur in sea-water, which is by no means well understood.'

"He also noticed, that a specimen brought by Mr. Schmidtmeyer, going to South America, from latitude 10° 50′ north, longitude 24° 26′ west, had an hepatic smell, and had blackened the bottle in which it was contained. If the existence of this curious phenomenon should be confirmed, the origin of the sulphuretted hydrogen will probably be found to be the same, as that of the same gas in various saline lakes in different parts of the world, from which trona or natron is derived.

"The mud of the Lonar Lake in India, of a lake near Maracaybo, in South America, and of similar lakes on the North of Africa, are all found to be thus impregnated. The sulphuretted hydrogen thus adhering to the clay, has been supposed to be derived from volcanic sources, but Mr. Malcolmson, in an able memoir lately printed in the Geological Transactions, says, that he has observed 'the same phenomenon in the salt water inlets, along the Indian coast, wherever the bottom contained argillaceous and carbonaceous matter;' and he ascribes the effect to 'the decomposition of the sulphates in the water by the carbon, and the clay only prevents its passing off into the air, or mixing with the water, by the power of adhesion.'

"The subject is full of interest, both in a practical and scientific point of view, and well worthy of investigation."

In a subsequent Report on additional specimens, Professor Daniell observes:—

"It is impossible not to speculate upon the origin of the deleterious gas, which has now been proved to impregnate the waters upon the Western Coast of Africa, in such enormous quantities, through an extent of more than sixteen degrees of latitude. It appears to me, that there are only two sources to which it can with any probability be referred, namely, submarine volcanic action, in which case its evolution might be considered direct or primary; and the reaction of vegetable matter upon the saline contents of the water, in which case it would be secondary.

"The probability of a volcanic origin is, I think, small, from the absence, I believe, of any other indications of volcanic action, and from the great extent of the coast along which it has been traced. What is known of the action of vegetable matter upon the sulphates, and the immense quantities of vegetable matter which must be brought by the rivers within the influence of the saline matter of the sea, renders, on the contrary, the second origin extremely probable. Decaying vegetable matter abstracts the oxygen from sulphate of soda, and a sulphuret of sodium is formed. This again acting upon water decomposes it, and sulphuretted hydrogen is one of the products of the decomposition.

"You will perceive that there is a large proportion of the sulphates in the different specimens of water which have been analyzed, and there can be little doubt, I imagine, that extensive mud banks must be formed at the mouths of most of the rivers on the western coast of Africa, within the tropics, consisting chiefly of vegetable detritus in the exact state which is most favourable to the action which I have described. This view rests upon experimental evidence, and upon considerations of great cogency, derived from the unhealthiness of certain well-known situations in which decaying matters from tropical vegetation are brought into contact with sea-water. I feel more than ever convinced, that the evolu-

tion of sulphuretted hydrogen is intimately connected with the unhealthiness of such stations.

"When this matter was first brought under my consideration, I was surprised that the nauseous smell which must necessarily be evolved from water impregnated with this gas, at so high a temperature as that of the equinoxial regions, had not been noticed. I have in consequence turned to some of the accounts of the late travels in Africa, to seek for evidence upon the subject; and in the narrative of an expedition into the interior of Africa, by the river Niger, by Macgregor Laird, and R. A. B. Oldfield, I found the following important observations: —'The principal predisposing causes of the awful mortality, were in my opinion the sudden change from the open sea to a narrow and winding river, the want of the sea breeze, and the prevalence of the deadly miasma, to which we were nightly exposed from the surrounding swamps. *The horrid sickening stench* of this miasma must be experienced to be conceived: no description of it can convey to the mind the wretched sensation, that is felt before and after daybreak. In those accursed swamps, one is oppressed not only bodily but mentally, with an indescribable feeling of heaviness, languor, nausea, and disgust, which require a considerable effort to shake off.' Now, these observations were made in the very locality from which some of the first waters which I examined were taken, and nothing more is wanting to identify the cause of the rapid decay of the ship's copper with that of the mortality of the climate. It has been experimentally found, that so small a mixture as a fifteen-hundredth part of sulphuretted hydrogen in the atmosphere, acts as a direct poison upon small animals, and the sensations of languor and nausea, described by Mr. Laird, are exactly those which have been experienced by persons who have been exposed to the deleterious influence in small quantities. The peculiar unhealthiness of mangrove swamps in all parts of the world, I have little doubt, arises, from that tree requiring salt water for its growth, and its decaying foliage being thus brought into immediate contact with the sulphates. The hypothesis also agrees with the fact, (which I believe has been established,) that the unhealthiness of such situations does not extend to any considerable distance from the sea."

ON THE PRESENCE OF URIC ACID IN THE GARDEN SNAIL, AND IN OTHER SPECIES OF THE GENUS HELIX.*

BY C. MYLIUS, OF BERLIN.

Uric acid, which M. Figuier unsuccessfully sought in the excrements of these animals (see *The Chemist*, Vol. I. p. 158), may be found in a glandular organ, immediately under the shell, secreted in the solid form. To obtain it, it is sufficient to make an incision and to collect the white liquid which it contains. When a certain quantity has been collected, it is shaken up several times with water, the mucus is thus held in suspension, and is decanted, whilst the uric acid is precipitated to the bottom.

This acid, thus obtained, is in pulverulent non-crystalline form. Examined microscopically, it presents perfectly spherical transparent grains, of various sizes. Each snail yields about nine centigrammes of it.

This acid has also been met with in other species of the genus Helix. The author found it in the *Helix Pomatia*, the *Helix Nemoralis*, &c. but not in snails of the genera *Limnæa* and *Planorbis*.

To prove the identity of this substance with uric acid, he made the following experiments:—

It did not dissolve in cold water: but little of it was dissolved by boiling; but on cooling a very opaque milky cloud was formed; the solution reddened turnsole. It did not dissolve in ether.

Alcohol has no action on it, either warm or cold; it is the same with muriatic and dilute sulphuric acids.

Nitric acid dissolves it with effervescence: the liquor reddens by the addition of ammonia: when it is evaporated and exposed to the vapors of ammonia, a magnificent purple color is produced.

It did not dissolve in a concentrated solution of potassa; but when diluted, it dissolves in it in very considerable quantity. Submitted to boiling with this solution, it does *not* disengage ammonia. The acids separate from it uric acid in a white powder. If it be located in a glass tube, carbonate of ammonia is sublimed and ammoniacal gas is disengaged: afterwards a very sensible odour of hydrocyanic acid and empyreumatic oil is developed, and a little carbonaceous matter remains. This substance burns without residue in a platinum crucible.

From these investigations it results that the uric acid of the snail is not combined with either ammonia or a fixed alkali, but that it is secreted in the pure state. Jacobson found uric acid in the garden snail, but he did not prove its purity.

* *Journal für Praktische Chemie*, Vol. xx, No. 8.

ON THE PRESENCE OF URIC ACID IN MOLLUSCOUS ANIMALS AND OTHERS OF INFERIOR CLASSES.*

BY M. J. J. VIREY.

Jacobson first discovered, in several gastropede animals, that the vessel containing the coloring matter is an urinary organ, with uric acid. M. Blainville, in his *Malacologie*, extends this observation to most testaceous and naked animals, showing that this bladder or purse being opened at the skin of the animal, yields urate of lime, with more or less color, forming the bands or maculæ of the shell of many of these animals. The same apparatus of depuration, furnishes the brilliant purple of *murex*, *buccinum*, *purpura*, *strombus*, &c. It is also to be remarked that, by different degrees of oxidation, urea also produces, according to Prout, rosacic and purpuric acids, &c.

This is not the only example of a deposit of urate of lime for the formation of shells; those of *birds' eggs* and of other *oviparous* animals (tortoises, crocodiles, lizards, serpents) more or less solid from the phosphate and carbonate of lime deposited on the gelatinous membrane which surrounds them, result from the calcareous salts brought there by the ureters of these animals in the *cloaque* where the oviducts terminate. Everybody knows that the excrement of birds, composing *guano*, and that of serpents, abound in urate of lime. The same, also, as the gouty see articular concretions of this matter deposited under their skin, on their feet and hands.

In like manner, insects present excretions of uric acid or urate of lime. Brugnatelli remarked abundance of it in the skins shed by silk worms. Many coleoptera, such as the cantharides and others, gave, by chemical analysis, uric acid (and these insects, taken internally by man or animals, act, more especially, on the urinary organs.) It is therefore a very general product of urinary depuration, even in animals to which nature has given neither bladders nor liquid urine.

ON THE PREPARATION OF THE WHITE OXIDE OF ARSENIC IN CORNWALL.

BY W. G. HENWOOD, F.G.S., LONDON AND PARIS.

Secretary of the Royal Geographical Society of Cornwall.

It is well known that the ores of tin are often so mixed with those of copper and iron, that their separation is an operation of much difficulty and expence.

This is greatly facilitated by roasting them in a common reverberatory furnace, whereby the specific gravity of the two last is much diminished, and the sulphur and arsenic with which they are combined are expelled. This poisonous mixture is prevented from injuring vegetation in the neighbourhood of the furnace, by being passed through a very long horizontal flue, or by being conveyed into a large and close chamber, in which it is deposited.

The substance thus collected consists almost wholly of sulphur and arsenic, and it was for many years rejected as utterly worthless. About thirty years since it was thought however, that the white oxide of arsenic might be extracted from it; this was successfully attempted by the late Dr. Edwards, who established a manufactory for the purpose near Parrenwell, which was long the only one in the United Kingdom. Within four or five years a second has been erected near Bissoe-bridge, and a third has been more recently set at work near Redruth.

The materials are now collected from the *burning houses* in all parts of Cornwall; and the principle adopted in their separation is the difference of temperature at which sulphur and arsenic sublime; the former being about 300°, the latter 330°.

They are first put into a common reverberatory furnace, having a very long flue, and the heat is so slowly increased as to dissipate the sulphur before the arsenic is volatilized; and this is assisted by means of small fires communicating with the flue in different parts, by which means the sulphur is carried far on it.

The temperature is then carefully raised, and the arsenic is driven off; but as the arsenic requires a greater heat than the sulphur, it is therefore more readily deposited on the sides of the flue. When this has been continued for a sufficient time, perhaps weeks, or even months, the fire is extinguished, the flue is opened, and its contents removed. The finer and purer parts of the arsenic are found, in a crystalline state, nearest to the fire; and as the distance from it increases, it is more and more mixed with sulphur: this is again placed before the furnace for a repetition of the process.

The purer portion is now introduced through a hole at the apex into conical cast-iron retorts, of about $2\frac{1}{2}$ feet high, and from 15 to 18 inches in diameter at the base. The broader ends of these are clamped to an iron plate, which forms the upper side of a flue from a rather small but very brisk fire, and the joints are closed by luting; the aperture at the top being shut by a plain iron stopper only. When the work-

* *Journal De Pharmacie*, Dec. 1840.

man thinks that the first charge has been all sublimed, he removes the plug, and through a funnel introduces a further supply, and so on until he imagines a sufficiently thick crust has been deposited within; the clamps are then taken off, the retort is conveyed into the open air, and its place is supplied by another.

These, whilst at work, are placed beneath a dome opening into the external air, in order that the labourers may not be injured by inhaling the mixture of vaporized arsenic with the atmosphere of the workshop.

The arsenious acid thus lining the retort is usually about an inch thick, and is very easily removed; it is of a pale amber color, and in that state large quantities of it are sold: sometimes, however, it is reduced to powder, and this is done in a grist mill of the ordinary kind.

This method is essentially different from the German mode, described by Mr. Vivian. (Cornwall Geological Transactions, I. p. 61.)

All attempts to prepare orpiment and regular (the red and yellow sulphurets of arsenic), in Cornwall, have hitherto been fruitless; and experiments on the extraction of arsenic directly from the arsenical pyrites, have been, in point of economy, equally unsuccessful.

It is not easy to ascertain the quantity of arsenious acid manufactured in this county. In 1826, 83 tons of it were shipped at Penryn (Cornwall Geological Transactions, III. p. 360), at present I believe not less than from 600 to 800 tons are prepared annually.

ON THE FOUL AIR IN THE CHALK AND STRATA ABOVE THE CHALK NEAR LONDON.*

In the last part of the proceedings of the Geological Society of London, the following communication, by Dr. James Mitchell, appears:—

In the chalk, the most abundant deleterious gas is the carbonic acid, but it has been found to exist in greater quantity in the lower than in the upper portion of the formation, and in that division to be unequally distributed. In sinking wells it has been noticed to issue with force from one stratum, whilst none has been perceived to be given out from the beds immediately above and below it. Dr. Mitchell mentions fatal effects owing to its occurrence in a well near the race-course at Epsom, where it was met with at the depth of 200 feet; and in Norbury Park, near Dorking, at the depth of 400 feet. On Bexley Heath, after sinking through 140 feet of gravel and sand, and 30 feet of chalk, it rushed out and extinguished the candles of the workmen; and in making a well in Long Lane, Bexley Heath, after penetrating 124 feet of overlying deposits, and then 90 feet of chalk, considerable inconvenience was felt from it, but six feet lower no gas was emitted.

In chalk, sulphuretted hydrogen gas is also occasionally met with, and is supposed to be generated from the decomposition of water and iron pyrites.

In districts in which the chalk is covered with sand and London clay, carburetted hydrogen gas is sometimes emitted, but more frequently sulphuretted hydrogen gas.

Carburetted hydrogen has seldom inflamed in wells, but in making the Thames Tunnel, it has sometimes issued in such abundance as to explode by the lights and scorch the workmen.

Sulphuretted hydrogen gas is more abundant, and it has been observed almost always to proceed from a coarse black sand, charged with oxide of iron, whether the bed be above the blue clay, within it, or below it. It has streamed out with great violence in the Thames Tunnel, but has in no instance produced fatal effects. At Ash, three miles from Farnham, a well was dug in sand to the depth of 36 feet, and one of the workmen on descending into it was instantly suffocated. Fatal effects have also resulted from the accumulation of this gas in wells in Maiden Lane, Battlebridge, and at Applexburg Street, near Cheshunt. This gas is much increased, after long continued rain, in consequence of the swelling of the clay driving it out of the interstices; and it is diminished after a long drought. The prevalence of a north-east wind has been noticed by well-diggers to diminish the quantity of the gas, but the effect is ascribed by Dr. Mitchell to the dry weather, which accompanies wind from that quarter. The author also suggests, that if wells are to be dug in dangerous districts, they should be undertaken when there is least water in the ground, or from the beginning of July to October.

The noxious gas in the weald of Kent and Sussex is stated to be sulphuretted hydrogen.

* From *The Inventors' Advocate*, No. 81.

A GALVANO-ARSENICAL APPARATUS†.

At the last meeting of the Royal Institution, Mr. S. T. Martin, of the Royal Veterinary College, exhibited this apparatus. The action depends on a well-known power, viz., that of resolving water into its constituents, and effecting the reduction of the metals.

The vessel and tubes being filled with a

† *Inventors' Advocate*, No. 81.

suspected fluid, rendered slightly sour by the addition of sulphuric acid (so as to make it a better conductor of electricity), is to be connected with a galvanic battery of a few plates, by means of electrodes dipping into mercury cups, when decomposition will immediately commence, and if any arsenic be present, the metal *arsenicum* will be resolved at the negative electrode in combination with hydrogen, forming arsenuretted hydrogen gas, which rising will displace the water in the tube.

As soon as the tube is full, the stop-cock is to be turned, and the gas inflamed as it issues from the jet, when on holding a piece of porcelain or a watch-glass over the flame, a metallic film will be deposited on it. That this is arsenicum is to be proved by the usual tests.

A solution of one grain of arsenious acid in a gallon of water, or of one part in above 76,000, has by it been made to yield many metallic films, and it is possible that the division might have been carried much farther, and yet indications of the existence of the poisonous agent obtained.

A DESCRIPTION OF A NEW FORM OF MAGNETO-ELECTRIC MACHINE, AND AN ACCOUNT OF A CARBON BATTERY OF CONSIDERABLE ENERGY.*

BY OLIVER W. GIBES.

It is well known, that if a soft iron bar be wound with insulated wire, and caused suddenly to approach and recede from the poles of a magnet, temporary magnetism will be induced in the bar, and an electric current in the wire surrounding it. This fact led to the construction of the magneto-electric machine, the principle of which consists in alternately induceing and destroying magnetism in a bar similarly wound with large wire for sparks and deflagrations, and with small for shocks and chemical decompositions. About eight months since it occurred to me that a more simple machine than those commonly used (and which all I believe resemble that of Saxton) might be constructed. My plan was, to take a bar of soft iron of an inch in diameter by ten inches long, and to slide upon the middle a disk of brass of two inches radius. This would divide the bar into two parts, upon one of which is to be wound three or four hundred feet of copper bell-wire well insulated, and upon the other and separated from the first by the brass disk, about four times that length of fine wire, say No. 25. If now one extremity of the coarse wire be attached to one pole of the battery, and the communication between the other extremity and the other battery pole be alternately made and interrupted by means of a rasp or toothed wheel, magnetism will be induced or destroyed in the iron bar, and consequently an electric current will circulate through the fine wire. The use of the brass is to prevent by means of a closed circuit any immediate induction in the fine from the coarse wire, which would inevitably take place were none interposed, and which would convert the instrument from a magneto-electric to an electro-magnetic machine.

Since the above was devised, an obvious improvement has suggested itself. This is founded upon the fact that magnetism is strougest at the extremities of bodies; and consists simply of dividing the bar into three equal spaces by means of two disks of brass similar in size to the one already described. The central division is then to be wound with the coarse, and the two outer or polar divisions with the fine wire connecting the two outer helices in such a manner that they may form one long wire. The battery current is then to be passed through the coarse wire, and the connection made and interrupted as before, by a rasp or other interrupting apparatus. As thus constructed, the instrument would produce effects similar to the common magneto-electric machine when used for shocks or decomposition. If it be desired to produce sparks and deflagrations, it would only be necessary to slide off the coils of fine wire from the poles, and to substitute in their stead others made of coarse wire of shorter length, and then transmit and interrupt the current through the central coil as before. We should then have within a much smaller compass, an instrument capable of producing all the effects of the common machine of Mr. Saxton, and by combining a number of such bars, we might form, in a comparatively small compass, a magneto-electric battery of great energy. Some of Dr. Page's beautiful interrupting apparatus might doubtless be used successfully with this instrument. As I have no opportunity to construct the instrument myself, I would suggest the trial, especially of the latter form of apparatus, to any who may be interested in the subject. Should it succeed, its advantage would be its superior cheapness and power, (?) and the little space it would occupy.

About the same time that the above instrument was devised, in looking over the list of substances which are capable of forming a galvanic circle together, I was struck with the much higher electro-negativeness of charcoal than of copper in relation to zinc; there being but six substances between zinc and copper, while there are eleven between zinc and carbon, which,

* From *Silliman's Journal.*

moreover stands even higher than gold, and next below platina. Besides this, its excellent conducting power seemed particularly to qualify it to act as an electrometer. Accordingly, I was led to consider that it might form an excellent battery with zinc or its amalgam, and mentioned the opinion to Prof. Renwick. I was, however, prevented from experimentally demonstrating its powers, until, in the month of March, I perceived in one of the foreign journals a short account of a carbon battery which had been successfully tried in England. I immediately constructed a small battery consisting of only six pairs of zinc and bituminous coal, and arranged as a *courronne des tasses*. The zinc plates were an inch square, consequently there were only six inches of acting zinc surface; the exciting liquid was diluted sulphuric acid. With this battery pure water was easily and rapidly decomposed, though from not having platina electrodes, and from the want of a voltameter, the gas collected was not measured. This experiment was witnessed by Mr. Shaeffer, assistant Professor of Chemistry in the College. To those who possess batteries of considerable power, I would suggest the employment, in some form, of carbon for electrodes in the place of platina. I hope soon to be able to present a series of experiments on the relative advantages of copper and carbon, especially in the case of the constant battery.

CONVERSION OF FIBRIN INTO ALBUMEN.*

M. Letellier announces that he has succeeded frequently in performing successfully the experiment of Denis, viz. of converting fibrin into albumen, by boiling 46 grs. of fibrin well washed and pressed in 155 grs. of water, and 7 grs. of carbonate of soda, until the magma which the mixture formed has disappeared. This result is in accordance with the view broached by Dr. Thomson, of Glasgow, upwards of thirty years ago, that albumen owed its fluid state to the presence of soda.

* From *The Athenæum.*

II. CHEMICAL MANUFACTURES.

IMPROVEMENTS IN THE ELECTROTYPE.†

At the sitting of the Academy of Sciences, Paris, on the 1st inst., M. Melloni made the following communication in the name of M. Cirelli, mentioning an improved method he has adopted of taking impressions in copper by the electrotypic process, directly from the drawings on paper.

"M. Cirelli, director of the Polygraphic Institution, at Naples, has sent a letter and various documents to me, relative to a new method of engraving on metal, by means of the galvanoplastic process. The first attempts of M. Cirelli commenced many months ago. Two Italian periodical papers, the *Lucifer* and the *Journal du Royaume des Deux Siciles*, allude to them in the numbers of the 15th of July, 1840. The inventor did not propose to obtain the copy of a model, or of an engraved plate, either indented or in relief, by two successive operations, but, by means quite independent of the art of engraving, to immediately produce the metallic plate accurately engraved, from a design, a lithographic print, or any other copy drawn on paper. M. Cirelli has already obtained a patent to make use of his method in the kingdom of Naples. He is not unacquainted with the galvanoplastic discoveries of Messrs. Boquillon, Sayez, Jugé, and Kohell; but he adds, that the investigations of these gentlemen are entirely different from his own; thus he has thought it desirable to distinguish the new art, which he has just discovered, by the particular denomination of electrotypy." We shall give an extract from M. Cirelli's letter. After briefly adverting to the principle on which the deposition of the metal is obtained from the solution of the sulphate of copper, he observes:—"In order to explain myself more clearly, I will submit to you the problems that I have proposed to myself, which I have solved.

"First—A design being given of any description whatever, traced upon paper, with certain peculiarities, which in no degree increase the difficulties of the artist, to produce the engraving of the same design on a sheet of revivified copper, by the process of Jacobi, and this to take place during the time that the sheet is forming, and without the hand of the engraver having any thing to do with it.

"Second.—A proof of an engraving being given, drawn with certain precautions, either from a plate engraved on copper or on steel, or from a lithographic design, to form in the same manner an engraving from this proof.

"Third.—Having obtained the first engraved plate in the manner that I have men-

† *Inventors' Advocate*, No. 81.

tioned, to repeat the operation many times successively on the same design, or on the same proof, so as to produce a great number of engraved plates, and all exactly similar, which only requires the time and expense necessary for the precipitation of the copper."

In support of these propositions, M. Cirelli sent four plates, which did not admit of the least doubt respecting their electrochemical origin, because the engraving on the front surface was equally distinct on the back; the two designs exactly corresponded, line for line, point for point, in every part. The first of these plates presented the figure of Volta with letters, and an outer line ornamented with figures and arabesques; it was produced from a lithographic proof. The second, taken from a drawing, represents the Hebe of Canova. The two others are duplicate sketches of an inscription, in which the inventor dedicates his attempts to the Academy. The second metallic drawing appears more pure, and is better executed. M. Cirelli also added many specimens from proofs drawn on paper.

It may be said, further, that though these experiments appear very remarkable, they are capable of great improvement. The inventor proposes to submit to the examination of the Academy new engravings, which he hopes to bring to perfection. This presentation he will accompany with a memoir, in which he will describe the modifications to which he has subjected the apparatus of Jacobi and of Spencer; he will at the same time make known the various modifications of which electrotypy appears to him capable.

ON VARIOUS APPLICATIONS OF THE REDUCTION OF METALS BY GALVANISM.—ON THE MULTIPLICATION OF COINS AND MEDALS.

To the numismatist, the reduction of the metals by galvanism is of the highest importance; for on the one hand it presents him with the means of having casts of coins and medals, which on account of their great rarity he could never otherwise possess,—and on the other hand it affords to the coin manufacturer the means of forging the more scarce coins, so that the collector must be doubly careful in making his purchases. At present, I am afraid, that our art, in unskilful hands, has been the means of destroying so many medals, that no benefit which has yet accrued has been able to compensate for their loss. There are three methods of taking the duplicate of a coin or medal. By the first, a primary cast or an intaglio is made in metal, directly by the galvanic precipitation; by the second a metallic cast of the medal is first obtained, either in fusible type or metal; and by the third, we make the intaglio cast in some non-conducting substance, as white wax, sealing wax, &c.

To take a primary cast at once from the medal or coin should not be attempted by an inexperienced hand, and never by any one from an unique specimen, for fear of any miscbance. The process, however, is simple and very valuable, when we desire a very perfect intaglio impression of any coin or medal. The object to be copied is to be coated on the side where we no not require the action to take place, with grease, wax, varnish, or other non-conducting substance. A very fine wire is to be passed round the rim, and then it is ready to be placed in the metallic solution. The adhesion of the air to the metal is of considerable importance in this case, and the metal should not be allowed to remain a single instant in the solution before the galvanic circuit is completed.

The obverse and reverse can be copied by two operations, or even both by one, taking care to grease the rim, so that the whole medal may not be confined by the new deposit. This operation gives us two moulds, one of either side the coin or medal in intaglio. By this process a copper medal or coin is liable to have its bronze removed, but a gold or silver one will not suffer the slightest injury. This mould may be used for making plaster casts, sealing-wax impressions, or it may itself be again used as a mould to receive the galvanic precipitate, and we may thus obtain a very perfect relievo copy of the original. Intaglios may be taken off coins or medals in lead, pewter, fusible type, tin foil or silver leaf, and these intaglios are then to have a coin soldered or placed in connection with them, when they will be ready for the reception of the metallic precipitation.

The third method, however, is the one which should be generally adopted; for, by non-conducting substances we can obtain most excellent moulds for receiving the precipitation. For coins, very small medals, and cameos, impressions in good sealing-wax are to be preferred by the AMATEUR. These must have a fine wire melted into the wax, and be blackleaded, and then they are ready to be copied.

Larger medals may be copied in wax, bees' wax and rosin, or plaster of Paris. The plaster of Paris must be rendered non-absorbent by any of the processes detailed in Mr. Smee's valuable work. Tallow

* *Smee's Elements of Electro-metallurgy.*

or spermaceti are best adapted, and from their being always at hand are to be preferred. They are then to be blackleaded, when they may be placed in the solution. By either mode perfectly sharp medals may be obtained.

To the workman who requires to make a large number of metallic impressions of coins, I would recommend the use of a square piece of plaster of any convenient size, say six inches each way, with impressions of medals as thick as he can put them. This might be easily managed by joining separate plaster moulds together till the size is obtained. This piece must be filled by the processes given before, blackleaded, and lastly, the metal thrown down upon it.

IMPROVEMENTS IN MANUFACTURING BEET-ROOT SUGAR.*

The quantity of sugar extracted from beet-root in the commencement of the process, amounted only to two per cent.; but it was afterwards made to yield five per cent.; and it was supposed possible to extract six per cent. On this calculation, the fiscal regulations for the protection of colonial sugars in France were founded; but recent experiments have been made, by means of which as much as ten and a half per cent. of sugar has been obtained. The following notice of the improved process is given in a recent number of the *Constitutionnel*:—

"It appears that a great improvement is likely to be made in the manufacture of beet-root sugar. Those who are acquainted with the process of this manufacture, are aware that M. de Dombasle has for the last six years exclusively devoted himself to bring to perfection the process of maceration, of which he is the inventor. Adopting recent improvements, this process is materially altered, and has now arrived at such a point of perfection that it could scarcely be exceeded. The society for the encouragement of national industry, in November last, appointed committees to examine the effect produced in the manufactory of Roville. They witnessed the entire progress of the work, every part of which was subjected to minute investigation. Similar experiments have been made in the presence of many distinguished manufacturers.

"We have not the least intention to prejudge the decision which may be made on this subject by the society we have alluded to; but we believe we are able to mention the principal results that have regularly attended the works of the manufactory during the year. The produce in coarse sugar has been more than eight per cent. of the first quality, and more than two per cent. of the second quality, in all nearly ten and a half per cent. of the weight of the beet-root used; and the quality of these sugars has been considered by all the manufacturers superior to anything of the kind that has hitherto been made, and admits of its being converted into loaf-sugar of the first quality. The progress of these operations is as simple as possible, and the expenses attending the manufacture are considerably less than that of the process hitherto adopted."

* *Inventors' Advocate*, No. 31.

APPLICATION OF ELECTRO-METALLURGY TO NUMISMATICS.†

BY ALFRED SMEE, ESQ.

At the meeting of The Numismatic Society, on the 21st of January, Mr. Alfred Smee delivered a lecture on the Application of Electro-Metallurgy, to the purposes of the numismatist.

He commenced by explaining the principle of metallic precipitations by galvanism, which he illustrated by a piece of zinc and silver, the latter becoming coated with copper when the two were immersed in a solution of that metal. The metals and carbon were then adverted to as capable of being employed instead of silver.

The apparatus to be practically used by the numismatist, he divided into two kinds —the single cell, and the battery apparatus. In the first, the arrangement of the zinc and medal to be copied are similar to the constant battery. The battery apparatus is composed of two distinct parts, a galvanic battery and a precipitating trough.

In the trough a plate of copper is placed to be dissolved, in a solution containing two-thirds of saturated solution of sulphate of copper to one-third of dilute acid, containing one part of acid to eight of water; but Mr. Smee stated that any solution would suffice, as he could obtain copper of any quality.

He then drew attention to the various modes by which Electro-Medallions might be made. By the first, a mould was taken directly by Galvanic precipitation; but he recommended that this should never be attempted with valuable coins or medals. He next mentioned silver leaf, tin foil, fusible metal, type metal, semi-fluid pewter, lead, &c. as capable of being used, but he stated that all these processes were, more or less, objectionable.

The processes for making moulds from non-conducting substances, were next described; stearine, white wax, bees' wax, and resin, sealing wax, &c. were mentioned, as answering for the purpose of moulds.

† From *The Athenæum*.

The latter was recommended for small coins and medals not larger than half-a-crown. All these different moulds required preparation, that is, they must be coated with some conducting substance before they are placed in the metallic solution. Mr. Smee prefers plumbago, and he dwelt upon the different qualities of that material. The last non-conducting substance mentioned was plaster of Paris.

After the mould was made, it required to be saturated with tallow, stearine, spermaceti, white wax, &c. The process was shown at the lecture, by boiling a small plaster cast in tallow; after this preparation the cast is black-leaded, and then it is ready to receive the metallic precipitation. Medals made by this process were exhibited to the Society; they were bronzed by a process devised by Mr. Smee. He then gave a brief sketch of other applications of Electro-Metallurgy, and exhibited electro-coppered baskets, fruit, leaves, and vegetables.

At the conclusion an electrotype copper-plate weighing fourteen pounds, made by Mr. E. Palmer from an original by Burnett, was exhibited to the Society, and the impressions of both the original and duplicate were shown, and no difference could be detected between them.

GALVANISED METALS.

M. Sorel has succeeded, by means of a constant electro-current, in fixing upon iron in the cold state a more or less thick and very adherent layer of zinc; and in the same way he has been enabled to fix several other metals.

M. Perrot, of Rouen, has been engaged with experiments upon the same subject.—*Athenæum.*

MODE OF PURIFYING WATER.

It is well known that animal charcoal possesses the property of withdrawing certain salts from their solution in water. M. Girardin, of Rouen, was lately consulted in a case where water kept in a new cistern became tainted by dissolving a portion of lime and cement; Girardin ordered about 24 lb. of ivory black, or animal charcoal, to be thrown into the cistern; in fifteen days the water contained no lime in solution, and since that time the water has been excellent.—*Ibid.*

NEW INDELIBLE INK.*

M. Bezanger has sent to the French Academy of Sciences a description of a new economical ink, for which he has taken out a patent. It consists of lamp-black mixed with caustic soda, and gelatine and caustic soda. By adding an aromatic gum to this ink, it is difficult to distinguish it from Chinese ink, its qualities being the same, alkaline and indelible, but its cost much less.

* *Moniteur Industriel.*

III. PHARMACY, &c.

MEETING OF CHEMISTS. — PREVENTION OF CHEMISTS FROM PRESCRIBING.

We take the earliest opportunity of laying before our readers a Report of the proceedings at the meeting, held at the Crown and Anchor, on Monday, the 15th ult. convened by advertisement, to take into consideration certain clauses of Mr. Hawes's Bill for the better regulation of the medical profession—that Bill being appointed for second reading on the 19th. The meeting was most respectably and numerously attended. Mr. Gifford was unanimously called to the chair.

The Chairman, having read a letter from William Allen, Esq., F.R.S., regretting the inability of his attendance on account of a previous engagement, stated that the meeting was called together to consider the important bill of Mr. Hawes, by which the interests of every chemist and druggist in the kingdom were materially involved. He then proceeded to notice the various clauses relating to the trade, which provided for the establishment of a medical senate, who should examine with respect to their qualifications, and grant licences and diplomas to all such persons who should, after the passing of the act, enter upon the business of a chemist and druggist. It also prohibited all such from prescribing or giving medical advice or performing any surgical operation, except those who had received licences as medical practitioners; and attached fines and penalties to those so offending. Persons actually in trade before the passing of the act, their assistants and apprentices, might, however, obtain licences to carry on the business without passing any examination. Such were the clauses which principally referred to their interests, and he left them in their hands for consideration.

Mr. Bell, of Oxford-street, moved the first resolution, to the effect that the provisions of the act were very obnoxious to the interests of the trade, would materially affect the comforts and resources of the poorer classes of society, whilst the facility which it afforded for laying informations would give rise to unceasing vexations. He contended that were the act to pass it would materially injure the profession, and elevate apothecaries at their expense. It ought to be left to the public to decide whether they would go to the physician or apothecary, or be content with the aid of the chemist and druggist. The act contemplated an unnecessary interference in the concerns of those who had always well managed their own affairs.

Mr. Keating, of St. Paul's Churchyard, seconded the resolution. The act of Mr. Hawes, if carried out, would prevent a chemist from interference even in the case of a person who had taken poison, and where he knew that a timely remedy would prove effectual. Besides, who was there constantly at home to attend to the wants of the poor, but the chemist or his assistants, who were always at hand, whilst the pursuits of the apothecary led him from home a great portion of his time?

Mr. Cooper, who was announced as attending the meeting on behalf of Mr. Hawes, in order to explain any parts of his hill, stated that he attended as an act of courtesy on the part of that gentleman, in order to satisfy them upon any point on which they might require information. He felt that a body like that of the chemists and druggists should not he neglected, for, that like medical men, their interests were identical with the public good. He thought that he should be able to prove that the bill would confer a great hoon—(laughter and uproar). There was only one point to which they could object, and it was that which restricted them in prescribing for patients. They were not only placed on the same footing as before, hut they would he more embodied; they would be protected in their trade from other parties who were not qualified to carry it on, and they would be freed from many parochial duties and other offices from which the members of other trades were not exempt —(hisses.) He could assure the meeting that Mr. Hawes had consulted persons connected with the trade, and that he would readily attend to any suggestions which might he thrown out. He was not connected with any medical association, hut it was a lay bill of his own, and he knew that he did not wish to upset any one branch of the profession for the benefit of another, nor would he throw aside the opinions, if he were compelled to reject the wishes, of any body of men. The only point on which they were at issue was, he conceived, as to how far a properly educated chemist and druggist should have the power to prescribe; and he considered it necessary that persons should he at least competent to the duty which they undertook. With that exception their business would remain as it now was. He would admit that surgeons ought not to be permitted to sell drugs, and he would he glad if any body of men could force that profession into a state of more respectability. This was a question, however, of practicability, hut he hoped that the day was not far distant when it would he adopted. It might be possible so to frame the bill as to make it all the trade could wish; and if they differed on some points, others might he extended to meet their wishes.

Mr. Barry asked if Mr. Hawes would postpone the second reading of the hill for a month, in order to allow time for its full deliberation?

Mr. Cooper said it would he impossible for him to pledge himself to that. It was not, however, necessary to oppose it at the second reading, for it would be in sufficient time to do so in the committee, when the hill was considered in its details, and when it would he read clause by clause.

Mr. Barry expressed his disappointment that it was intended thus to hurry the bill forward. The intention of the act was that the druggists should he registered hy their rivals, and time ought to be given for petitions from the country and the public, who were equally interested. Let surgeons continue to sell drugs, as they are their rivals, hut let not so tyrannical a measure be passed as would inevitably sacrifice the chemists and druggists to the apothecaries. They ought to unite in their own defence, as the hill was not founded upon equitable principles.

Mr. Payne, as a member of the Apothecaries' Company, advised the meeting to attack the hill at the threshold of the door. If they were not allowed to prescribe it would he necessary for them to shut up their shops—(hear). Look at the druggists' shops in poor neighbourhoods, and see the advantage which they conferred. They were the physicians to the poor, and by the facility which they afforded for aid, disease was often stayed in its infancy. No legislative interference could point out where the line of demarcation should be drawn, hut they should leave it to the public to judge for themselves, in whom they could repose their confidence. He would venture to assert that no druggist would risk his reputation hy going further than he ought in giving his advice—(hear).

Several gentlemen having spoken upon

the resolution, it was ultimately agreed to.

The next resolution, which was carried, was to the effect that Mr. Hawes, the proposer of the bill, should be requested to defer its second reading for a month. Resolutions declaratory of the hostility of the meeting to the clause for preventing chemists and druggists prescribing, and that the attention of the trade should be drawn to the subject by advertisements in the daily papers, were also agreed to. Mr. Pigeon, treasurer to Guy's Hospital, was appointed treasurer, and a committee was formed, composed of representatives of the leading wholesale houses, and the leading retail chemists of the metropolis.

In the course of a long meeting it was admitted by most of the speakers that some of the plans of Mr. Hawes, for improving the education and qualifications of members of the trade, might be advantageously introduced.

The present attempt at preventing chemists and druggists from prescribing is what was urged on the passing of the Apothecaries' Act, which came into operation in 1815, but which was renounced on account of the strong opposition raised against it. A superfluous fund remains in the hands of the trustees, which, it is believed, may be available to the purposes of this association.

A very liberal subscription was entered into, and a strong appeal will be directed to the trade.

The following is a copy of the resolutions passed at the meeting:—

Moved by Mr. Bell, seconded by Mr. Keating, and resolved,—

"That the provisions of this Bill deeply injure the interests and lessen the usefulness of Chemists and Druggists, as well as affect the comforts and resources of the poorer classes of society, whilst the immediate and pressing wants of individuals would create a liability to informations, the which would be a source of unceasing vexation."

Moved by Mr. Barry, seconded by Mr. Farmar, and resolved,—

"That it is the opinion of this Meeting, that Benjamin Hawes, as author of this Bill, intituled "A Bill to amend the Laws relating to the Medical Profession in Great Britain and Ireland," should be requested to defer for One Month the Second Reading, to enable the Public and all Parties interested to form their opinion upon its merits."

Moved by Mr. Walker, seconded by Mr. Ince, and resolved,—

"That Petitions be immediately presented to Parliament against Mr. Hawes's Bill, especially against that Clause depriving Chemists and Druggists of their right to prescribe and recommend medicines."

Moved by Mr. Wilkinson, seconded by Mr. Mayhew, and resolved,—

"That the following be a Committee, with power to add to their number, for the purpose of watching and opposing the progress of this Bill, viz.:—

William Allen, F.R.S.	Thomas Herring.
Joseph Gifford.	Thomas Walker.
Jacob Bell.	Thomas Keating.
Charles Dinneford.	Edward Winstanley.
John Toller.	George Waugh.
Joseph Smith.	Thomas Butler.
Richard Battley.	Samuel M. Mayhew.
John T. Barry.	Robert Farmar.
John Ellis.	Samuel De Castro.
Samuel Foulger.	Samuel Green.
William Lowe.	Edward Simkin.
Charles Davy.	William Ince.
Edward Horner.	Edwin Briggs.
Richard H. Pigeon.	George Baxter.
Thrower Herring.	J. S. Lescher.
Charles Barron.	G. W. Smith.*

Moved by Mr. Dinneford, seconded by Mr. Austin, and resolved,—

"That R. H. Pigeon, be appointed Treasurer, and Subscriptions solicited from all the Chemists and Druggists of the United Kingdom."

Moved by Mr. Keating, seconded by Mr. Watts, and resolved,—

"That a Copy of these proceedings be printed, and sent to every Member of the Drug Trade in Town and Country, and also be published in the Newspapers."

Moved by Mr. Herring, seconded by Mr. Farmar, and resolved,—

"That the best thanks of this Meeting be given to the Chairman, for the efficient performance of his duties."

In commenting on the results of this meeting, we feel bound to call the attention of our readers to our constant and vigilant advocacy of their rights, even from the first

* The name of Mr. Ralph Stamper has since been added.

number of this Journal, which was established in order to form a record of all discoveries and improvements within the period of publication, in CHEMISTRY, CHEMICAL MANUFACTURES, and PHARMACY, and to he the medium of communication through which they might, at all times, be enabled to increase their knowledge, to protect their interests, and improve the condition of their branch of the profession; and thus defend themselves against the perpetual and unfair encroachments and aggressions of general practitioners, who, both privately and publicly, are constantly seeking to oppress them and detract from their rights, with every advantage of effecting their objects through the medium of a work peculiarly addressed to them.

Under these circumstances, it is quite evident that general practitioners possessed the advantage of a channel of publicity through which to advance their own interests and keep up a perpetual distrust and outcry against Chemists. It was necessary, therefore, that there should he established a Journal that would give to the latter similar advantages, by supplying a continued source of improvement in knowledge, and likewise preventing the total destruction of their business. This want of a medium of public communication, has long been felt, and our labors, in THE CHEMIST, to supply it, have been received with an unqualified approbation of our readers and contemporaries which we shall study to preserve.

Long have the Apothecaries* had an organ through the medium of which they have constantly kept up a running fire against Chemists and Druggists exercising that power, which we defy them or any acts of the Legislature to prevent; for to render aid in immediate distress of any kind is the birthright of every human being,—

"Man to man must bring relief."

And we are satisfied, that in cases of temporary urgency, they have shewn as much regard to the safety, and, considering their education, displayed an equal degree of intelligence where they have ventured to interpose their sudden and promptly needed advice and assistance, as those by whom they are denounced, in THE LANCET, as "ignorant chemists and druggists, and illiterate pretenders and impostors."†

Now we have had the most extensive experience of the degree of knowledge possessed by the general practitioners, and we regret to say that it has always been of the most limited and smattering kind; their prescriptions evidence a despicable ignorance of Pathology, Chemistry, and Materia Medica, and are in every respect lamentably destitute of literary accomplishment.

We too plainly foresaw the difficulty which any member of the Legislature would have to encounter, in his attempt on this subject; and regarded his undertaking as one of a most unenviable character: there is, however, this consolation,—that, so far as founded on reason and justice, he would find equable measures of medical reform meet the most cordial approbation and support of all respectable chemists; who, though courageous enough to resist any attempts instigated by the "Gallipots" to destroy their business, are anxiously desirous to qualify themselves, and undergo the ordeal of examination. It is now quite clear that the all-important and difficult question, of allowing or preventing chemists from advising among the poor, and in pressing and urgent cases, would he set at rest by this creditable resolution; for, as it is impossible to prevent them by any acts of Parliament,—and, indeed, the withdrawal of the clauses of the bill attempting it, evinces that it is,—the liberal and emulous spirit exhibited by them meets the case in the only and best way, namely, by acquiring the knowledge by which they will be enabled to exercise, WITH proper qualification, that right which they now possess, and no power can obstruct their employing WITHOUT.

* Such, only, are ninety-nine out of every hundred, however sore they may feel at the appellation, and prefix the stolen title of "Surgeon" to get rid of it. We think there is greater need for reform here, than in any practices of chemists.

† Of course, it is to be taken for granted, that that branch which is particularly advocated therein, is an example of learning and science, if the getting by heart the interlinear translation of the first four books of Celsus constitutes the one, and the mistaking the gracilis muscle for the great sciatic nerve does the other, as we have seen.

Now comes the enquiry, who are to be their teachers and examiners? and at what school are they to be taught? Is the College of Physicians, or Society of Apothecaries to have this charge? Are they to have this power over them,—they, their oppressors and opponents? Is the power of exclusion to he vested with them, wherever their interests and petty feelings are called into action? From such bands as either, God deliver them! Infinitely better would it be to allow the attempted restriction to pass into a law, than to deliver them into the clutches of these parties: nay, the very intention of the rejected clauses is quite enough to convince us of the *good offices* of the apotbecary, who, of course, caused their introduction, and offers palpable evidence of the tender mercies they would have to expect if placed under them in this respect: these parties would indeed gain their end by the exercise of their privilege—rejection and partiality against which we by no means think them proof—with the most perfect and stringent rigor as if any law to restrict their giving advice had been passed.

Little need is there of any fear that teachers of equal merit, and a method of teaching of much greater value than any now adopted, will soon spring up among Chemists and Druggists; for, bad indeed must be their condition as regards knowledge, if they are compelled to seek teachers from the ranks of general practitioners.

We are bound also to advise them to offer opposition to any increased power in the medical corporate bodies. We shall neglect no means of offering our protest against the slightest increase of power and advantages being given to them in any acts introduced into parliament. Urgently do we advise them to pursue this course; and are sure that they will soon outstrip their opponents in usefulness, especially to the poor; if they do not equal them in the acquisition of wealth. To attain a respectable standing in the profession, and remove distrust and obloquy, it is indispensable that the pupils, apprentices, and assistants of chemists and druggists should be required to obtain a competent knowledge of chemistry, botany, materia medica, and pharmacy; which will give them the necessary acquaintance with the laws of chemistry and chemical agents, and the nature and properties of the plants and other substances employed in the restoration of health: they will no longer be stigmatized as mere automatons, dealing in articles of whose uses they are ignorant.

We are authorised to announce their wish and desire to obtain a suitable education, and undergo a corresponding examination, calculated to enhance their respectability, and thus flinging in the face of their maligners the odium cast upon them, to insure the confidence of the public, and quite as much to deserve it as any class of the profession, of which, many of them are now distinguished ornaments. This voluntary declaration of a desire for knowledge evinces a spirit which we could wish to see in other ranks of practitioners, now infinitely more ambitious of profit, than distinction in science. Highly necessary is it for them to acquire sufficient knowledge to render assistance, without the risk of injury to the public, or the endurance of professional insult.

We now come to mark the very mild tone exhibited by *The Lancet* upon the result of this meeting, so smooth compared with the inflammatory character it usually assumes, that we are led to fear, and caution our readers against supineness, lest they may be surprised on a sudden, and find that the embers have been only smouldering, not extinguished, and are ready to blaze forth in a moment.

With ceaseless vigilance therefore do we urge them to guard their interests: we distrust the new Bills about to be introduced into parliament by Mr. Warburton and Mr. Wakley; for it is easy to see, that although Mr. Hawes has consented to withdraw the clauses from his bill which related to chemists, others are more likely to introduce such enactments as, though they do not interfere, in the same way with them, will have the effect of giving such advantages to apotbecaries, as may at once prove the destruction of the interests and rights of chemists; for we are perfectly satisfied that medical reform is a mere blind, and that the real objects sought to be obtained are nothing but a still further infringement on the rights which peculiarly belong to chemists and others of the profession, already sufficiently injured hy their innovations and

encroachments. Any reform of medical practice entrusted to the existing corporate bodies will be worse than the Cardigan farce: all the paraphernalia of justice will be displayed in order to make the mockery of it appear the more evident.

ADULTERATION OF DRUGS.

BY CHARLES WATT.

From the labor we have bestowed, and are resolved to continue, on the important subject of adulteration of drugs, we are in no expectation of receiving the smallest benefit, other than that which may result from the exposure of such infamous atrocities as have so long been suffered to go unchecked and unpunished, and have excited no more care on the part of the body,* bound to watch over these affairs, than they have from the Legislature, equally bound in duty to protect the public and fair dealer by laws framed to punish those who are guilty of such heartless ingratitude and villany.—Our duty to the public demands that we seize every opportunity to prevent injury and render benefit; these are our only aims, and their attainment our best reward; and we are not without a well-founded hope, that if we do not accomplish *all* that we could wish on this subject, we shall, at least, arouse public attention to it. If we fail in making men honest, we may nevertheless have the satisfaction of promoting their detection and insuring their punishment. It may, we will admit, become apparent, that that much is left undone; we trust, however, that it will be equally manifest that much likewise is performed; and we are not to be deterred from attempting to do good, because we are unable to reach perfection.

In the course of our inquiries and search for information on this head, we have brought to light a catalogue of depravity that cannot fail to fill our readers with equal surprise and disgust, at practices as disgraceful and cruel as ever stigmatised a community, even of the lowest grade in civilization.

The accounts we have at times already given in THE CHEMIST, form not a tithe of what has since been furnished to us from every quarter of the United Kingdom. The nefarious frauds and cheats which are practised in drugs—not on a few merely, but on every one which is employed for the restoration of health—exceeds all description or belief. Some who are desirous that the present state of things should be continued, may wish that we would relinquish our purpose; but we know that by every house of character and respectability, our labors are appreciated, and are held as productive of much good to the public, and those dealers who are above the commission of fraud. We have received the thanks of many, and are solicited to continue our course. Independently of the injury to the public, what is the effect produced on the honorable and fair dealer—on the upright man, who will not soil his mind, nor debase the reputation of his house by such conduct? He of course cannot afford to let goods of a genuine quality go for prices at which adulterated ones are sold; hence he is greatly injured by the public dealing with parties who can undersell only because they keep and deal in spurious articles. The advantages these wretches possess will be easily understood by the following anecdote:—

A gentleman having been in the habit of having dispensed at one shop a box of pills, for which he paid only one shilling, happened to take the prescription to another, at which he was charged four and sixpence. Surprised at this charge, he paid it with great anger; upon which the chemist requested, and he agreed, to go to the Apothecaries' Hall to ascertain the regular price. On enquiry there he was informed that one of the articles—James's Powder—would cost three shillings and threepence of the money. At this he was so satisfied that he returned and made every acknowledgment to the chemist. Our readers will readily judge, that for James's Powder the first person had substituted the antimonial powder, which, it is universally admitted, is in no way equal to the true preparation, for physicians write for it thus:—"Pulv. Jacobi verus."

It is with no small surprise we reflect on the length of time these abominations have been allowed to go on, without any one member of either House of Parliament interfering to prevent them. That they should never have excited any member of the profession whose duty it is to correct all abuses, is no matter of wonder. This Body has long been regardless of its original intentions; with them it appears as if

* The College of Physicians are empowered to send their censors to visit shops and inspect drugs; but who ever heard of their performing this duty? And, from what has of late come to our knowledge, we much doubt their qualification to perform it if they undertook it. The whole Augean stable of these corporate bodies wants clearing out from one end of the profession to the other. Can any good arise from a corporation compounded of such elements? They must be dissolved, for they are worthless.

they were actuated by the motto—
'Labitur et labetur in omne volubilis ævum."

From the period of our first number, to the present time, we have called public attention to it, and it is only since we have pursued the subject that any notice has been taken of it. It is now, however, before the public, and we doubt not that good will result from these exertions. It may here be asked—why not memorialize, or lay the matter before, the Government? To this we reply, that we should have but little faith in any success from such a course; and as little will our readers, when they peruse the following statement of the manner in which the stores for the service of our brave army and navy are supplied; and it furnishes another palpable instance of pandering to popular opinion, by the apparent study of economy, to the sacrifice of those who have bled in the cause of their country, and to whom Britain owes her greatness, and Europe its tranquillity; and to whom they must again trust in the hour of danger. Of all men, they deserve especial care in illness or accident—the heritage of their profession, and the disease that awaits their hazardous perils. Infamous indeed is that parsimony which is shown in so sacred a trust, while thousands are lavished in berths and sinecures, to pamper with voluptuousness and luxury imbecile striplings, the "lilies that toil not, neither do they spin."

Little, we repeat, is to be expected from this government, by way of correction of the base practice of adulteration, and the public will perfectly agree with us in this view of the case, from the following details which have come to our knowledge from the most authentic source, and we are ready, if called upon, to substantiate the facts, before any authority. The contracts for supplying the medical stores of the army and navy, until of late, were always given to Apothecaries' Hall; they are now, however, taken away from that establishment and given to a private channel, merely because the estimate was lower than that of the Hall. The orders of the authority who rules in that department were "to take the *lowest* tender;" and upon being asked if samples were to be sent, the order was repeated—to take the lowest tender, and no mention of samples was made. On another occasion one of the medical board was asked by a principal and respectable house to inspect some samples, and gave for an answer that if he did he could never get through his business. Indeed we have never heard before this time that medical boards were so over worked, but we have often heard of their being overpaid and doing little. We suspect that two better reasons than the doctor advanced, made him decline the task—the one the trouble of the duty—and the other his ignorance of the subject. He has one consolation, that is, he is in no danger from this ministry in losing his ample salary, or rather sinecure, as the preceding statement evinces; and no doubt the doctor is happier without the trouble, and quite as much so without the knowledge; therefore—

"Where ignorance is bliss 'tis folly to be wise."

To attempt reform here would be insane, the whole squad ought to be sent to the right about, and their departure accompanied by the rogue's march.

To particularize every article of adulteration, would be in fact to give a list of all the substances in the Pharmacopœia. Such instances as have come to our knowledge at present,—and they are indeed FRIGHTFULLY NUMEROUS,—will suffice to shew the lamentable state of the laws on this subject, and the infamous conduct of those whose duty it is to provide against these practices. Public attention is aroused to the subject, and if we may judge from past experience, publicity of these frauds and exposure of their perpetrations, will be the most effectual remedies.

We shall, however, detail a few instances in order to satisfy our readers on the subject, and to shew the urgent necessity of the power of punishing offenders in these respects being demanded.

Our readers are well aware of the source whence is obtained the genuine sulphate of quinine, viz. from M. Pelletier. The method of adulterating this is by various inferior and costless articles, as with magnesia, and even sulphate of lime. Pelletier's labels are copied and can be procured at a few pence per dozen: these are pasted on the bottles, and this spurious compound is sold as the pure sulphate.*

Even in the common article of blue pill, we find that the conserve of roses is omitted, and that the mercury is in very small quantity; while the color is imitated by the addition of coloring matter.

In the article of scammony, the basest practices exist. The merchants here order it to be sent over by the parties abroad, adulterated so much per cent., the amount of it being directed according to the conscience of the merchant—never over scrupulous.

Jalap is mixed with various inferior or damaged sorts, and also with Linseed meal. Turkey rhubarb at sixteen shillings per pound, is largely mixed with British, at one shilling per pound, or this latter is wholly substituted for it. English oil of lavender at thirty-six shillings per pound, is mixed with American at sixteen shillings, or this is sold for it. These frauds are by no means confined to

* See *The Chemist*, vol. I. p. 94.

retail dealers; they are largely practised by wholesale houses; but they shall not long remain in their hiding places: to the public scorn will we, in due time, consign them.

We rejoice that our labors to devise some means of analyzing and detecting these frauds, sufficiently accurate for all practical purposes, have not been in vain, and we shall unremittingly carry them out against their authors by holdiug them up to public detestation, and using every effort to secure their punishment. Our utmost vigilance, watching over the course taken by the legislature on this importaut suhject will rigorously be employed, aud our readers will, from time to time, be made acquainted with every matter which may be worth communication.

It now remains to state the remedies we propose to adopt in order to remove these abuses, aud the punishments to be inflicted on their authors. These are the same as we proposed in the advertisement of our first number, namely, the appointment of a Board of Commissiouers, not members of the College of Physicians, nor of the Apothecaries' Company,—for these have too long shewn their negligence, and demerit of public confidence, in their failure to perform the duty, and we can add our thorough conviction of their want also of knowledge,—but of persons selected from among those whose skill in the nature and qualities of drugs, is known and proved to have been acquired by constant practice and ample experience in them; and not favourites put in merely to provide them with places, which interest and good fortune alone make easily accessible to them.

It should be the duty of these commissioners to inspect all shops, and condemn all bad drugs, and summon the party keeping them before such authority as, upon conviction, is clothed with the power of inflicting fine and imprisonment. The urgent necessity of such a course is most amply proved by the receut case brought before Mr. Alderman Pirie, by Mr. Foster, of New City Chambers, in which it was proved that the medicine chest of an African captain contained no one article of even decent pretension to the quality of the substance its label denoted. Should this diabolical practice be allowed to continue? Ought not proper persons to be appointed to visit the low shops and inspect the drugs and medicine chests of those parties supplying them? We see written up on the boards of some of these men—"Medicine chests fitted up!" fitted up indeed!! Let only any competent person go the round among the many meagre and dimly lighted shops in the bright regions of Wapping, Shadwell, East Smithfield and Ratcliffe Highway, and he will then indeed be satisfied of the infamous cheatery and impositions practised by these men, upon the seafaring part of the community. We know them well, and they shall not continue in their traffic without the finger of public scorn being poiuted at them. Our frequent visits to Liverpool, Bristol, Portsmouth, &c. &c. enable us to state that the like is practised to an extent, even greater, if possible, in those parts.

The foregoing remarks on this subject must for the present suffice: we doubt not they will convince our readers of the direful prevalence of fraud, so injurious to society, and destructive to the upright and honorable dealer, and so detrimental to the credit of the trade; and that our observations have not been uncalled for, or irrelevant, made as they have been under the firmest conviction that we cannot more faithfully conserve the interests, nor promote the benefit of it, than by advocating its integrity and correcting its abuses.

We may, and doubtless we shall, incur the virulence of those who are affected by our attention to this suhject; but our duty to society demands of us utterly to disregard their opinion. We shall continue our utmost efforts to suppress, if we cannot wholly prevent, these criminal proceedings; and whatever may take place from obloquy and aversion from such a quarter, we shall obey the motto,—"GO FORTH AND FEAR NOT!"

ON THE ADULTERATION OF DRUGS.

To the Editors of The Chemist.

GENTLEMEN,—It is with very great pleasure and satisfaction that I observe your strenuous exertions to bring to light the gross adulterations, to which many of our most valuable medicines are subjected. I am truly sorry to think how common this abusive practice has of late years become, for even our most useful condiments in daily use suffer under the hands of the evil disposed. It is my intention at present, to throw out a few general hints on this system, and I shall in all probability at some future period return to it in particular.

It pains me, Gentlemen, to see the once respectable trade of Chemist and Druggist so much on the wane; but I cauuot help remarking, that the very members of that profession, whose duty it ought to be, to support the dignity of their trade, to the utmost of their power, should be the persons who have for some time, and are still engaged, in bringing it to ruin. If men would only reflect, they would at once see, that they are acting in direct opposition to their own interests. Adulterations appear to me to be of two descriptions, and which I will term WHOLESALE and RETAIL; and

here many may suppose that I ought to enter upon the merits of the question, which bas been so often discussed,—namely, whether the London wbolesale house or the retail vendor of medicine is the party at fault. Both certainly are to blame; for I would ask, why the wholesale dealers should be able to offer Scammony (as an instance) at five or six different prices? Yet the fact is notorious, that many London houses will offer you this drug at 20*s.*, 24*s.*, 26*s.*, 30*s.*, and even 36*s.* per pound. Now, what are we to think of the quality of the lowest priced Scammony, or of its effects on the constitution? And this is but a solitary instance, for there are numbers of people who will sell you drugs at half a dozen different prices, and tell you tbat their articles are ALL GOOD and GENUINE.

Take for a moment into consideration, tbe object and use to which drugs generally are subservient; think of tbe peculiar effects expected to be derived from minute portions of those substances, and then enquire, what must be the character of tbat man, who can so trifle with the best feelings of our nature, by giving what be knows to be comparatively inert, for the mere purpose of saving a few paltry pence. But if tbe house from which those spurious drugs emanate is to be reprobated for its conduct, how much more necessary is it that dispensing chemists should be careful in the selection of their drugs. For my own part, I do conscientiously think that few respectable wbolesale druggists will knowingly send out bad medicines, provided a good price be given. But then there are so many sources of opposition, so much to convince and overcome, ere they can obtain a fair price for good drugs, tbat (with shame be it spoken) they are sometimes driven by necessity to keep and vend comparatively inert trash, in order to *oblige their customers.*

I am tbe more disposed to believe tbis, when we observe tbe path followed by retail cbemists at the present time, and we bave every reason to believe tbat within the walls of tbe laboratory drugs are mixed witb extraneous matter, or wbat is facetiously termed *improved.* As some foundation for this idea, allow me to briug forward one or two facts, whicb I think, Gentlemen, you will admit, militate not a little against the chemist.

A *respectable* druggist in tbe country is just now selling mercurial ointment for 1*s.* 10*d.* per pound, the lowest market price in London being 3*s.* per pound. Ground black pepper is sold in this city at 10*d.* and 11*d.* wbile the berries bought in large quantities by the bag are worth 1*s.* and 1*s.* 1*d.* in town.

But is it not also monstrous, that in this town there are druggists, who have their windows placarded with intimations that the best seidlitz powders, are to be had for *eight-pence* per dozen,—nay, do we not observe the public newspapers, a receptacle for such announcements? Now tbe mere cost of *proper* ingredients would come to this money independent of various concomitant expenses. In these rascally modes of proceeding some ingenuity, worthy of a better cause, is displayed. In the first instance, the blue ointment is reduced with *lard* colored with Prussian blue. The pepper is mixed while grinding with linseed meal, or what is technically termed P. P, which, to be understood, is the powder of an inert and useless body, worth 2*d.* or 3*d.* per pound. The seidlitz powders are almost entirely composed of bruised glauber salts, to which is added the quantity of carbonate of soda, and two or three drops of oil of lemons.

Upon a perusal of the powders, it is not an unfrequent circumstance to be able to pick out a crystal of the sulphate of soda,—while, if sufficiently bruised, the color, when compared with that of a genuine powder, will at once be found black and dirty. But we we have the cheap powders eulogised by the bighly pleasing intimation of being "Lemon flavored,"—true "Lemon Seidlitz Powders:" thus they get rid in a great measure of the nauseous taste which would and does predominate.—so much so, that many are unable to swallow the draught, while with others a disagreeable drastic effect is the consequence. I was very much amused two or three days ago. Having occasion to pass along one of the most obscure streets of our city, bearing somewhat a comparative analogy to the St. Giles of London, to see tickets in more than one of the paltry gin shops, boldly intimating,—"here was to be had best Lemon Seidlitz Powders one penny each, or twelve for eightpence." So much for the far-famed Seidlitz Powders. I cannot conceive wby a druggist should for a moment attempt to gain the better of bis brethren hy producing an inferior article, witb the cognomen of best, and sell it at an inferior rate. It resemhles a man rolling up some part of a dress, and marking it "finest and most superb," while it is either in perfect tatters, or made from the most common material. But we here have exemplified the evil of bad conduct. No sooner does one man appear to dispose of a quantity of one article rendered impure by tbis nefarious plan of mixing, than another follows his bad example by imitating him; and thus the public, a little at a loss, and staggered by low prices, become their patrons, until baving practically felt the baneful effects of cheap medicines, tbey leave them in disgust. But although there is thus a remedy carried along with

the evil,—we cannot so easily discover a cure for adulteration in some of the more particular substances. Thus I have been told, on undoubted authority of a Chemist vending the P. Antimonialis, for true James' Powder, and charging one penny per grain, and from the same source, that Tinct. Opii is adulterated with burnt sugar. I am sorry to say that this latter instance of adulteration is followed by many, as was proved by Professor Christison of this University, who, about two years ago, published a paper in the Edinburgh Medical and Surgical Journal, wherein he stated the result of his analyses upon several quantities of Tinct. Opii, derived from various shops in this place, and by which he proved, that sugar was found in many of them.

I may be considered as severe against retail Chemists generally, but I can assure you, Gentlemen, that I can give localities and names for every statement I have made in this letter. There are several additional circumstances which I could here adduce, but which I consider to be unnecessary.

There is also another source of fallacy, both as regards the wholesale and retail drug venders, which ought not to be passed over in silence. There are many articles in our Materia Medica which spoil by long keeping, such as the Vegetable Powders, particularly Corium, Digitalis, Hyoscyamus; some roots, as the Sarsaparilla, and others which I need not enumerate. Now it is but an act of justice to the public generally, for the retail Druggist to be on his guard, and if medicines be sent to him in a deteriorated condition, forthwith to return the same, or if he hold any such, to throw them out immediately. Thus, to preserve the powders above-mentioned, small quantities ought only to be powdered at once, and never retained longer than six months, while the stock of the herbs should be carefully preserved from the light, and powdered as required.

Druggists generally call out loudly about Quackery; but really, Gentlemen, unless we have a reform amongst the Chemists, I think that greater empirics can nowhere exist, while they are enabled to cloak their proceedings under the garb of respectability, and thus impose upon and rob the people, in such a heartless and knavish way, that one is really disposed to condemn their proceedings, and to hope that your excellent advocacy of the honorable system may bring about some substantial good.

I remain, Gentlemen,
Your most obedient Servant,
A RETAIL CHEMIST.

Edinburgh, 16th Feb. 1841.

IMPROVED METHOD OF PREPARING THE NITRATE OF MERCURY OINTMENT.

This very useful ointment, when in its stronger form, is so hard and friable as to be very inconvenient, especially in winter.

The Pharmacopœia orders that the lard and oil, while hot, should be mixed with the solution of mercury, also hot. I have found, that if, instead of employing lard, olive oil only (of course the same quantity of *it* as of lard and oil together) be added to the nitrate of mercury, while both are cold, a very beautiful ointment is produced, of the same consistence as spermaceti ointment. The formula for preparing it would be thus:—

Take of mercury, one ounce,
Nitric acid, eleven fluid drachms,
Olive oil, ten fluid ounces.

Dissolve the mercury in the acid, and let it become cold. Add the oil, and stir the mixture occasionally for an hour or two, until it becomes united and of a proper density.

The strength here is the same as that ordered by the Pharmacopœia, and it is obvious that there can be no difference in the effect from the substitution of oil for lard.

G. E. J.

ERRORS IN DR. THOMPSON'S CONSPECTUS.

To the Editors of The Chemist.

Gentlemen,—Your correspondent J. H. (see Vol. I. page 250.) having not yet sent you any more of the errors in Dr. Thompson's Conspectus, to which he has so properly called the attention of the public, I take the liberty of sending you the subjoined, thinking that such an important subject should be delayed no longer.

I remain,
Gentlemen,
Your obedient servant,
—— R. N.

Acid. Hydrocyan. Dilut.—Dr. Thompson here orders Oſs of distilled water, in the place of Oiſs.

Cataplasma Conii.—℥j of the Ext. Conii ordered, instead of ij.

Cerat. Hydrarg. Co.—Entirely omitted.

Cerat. Plumbi Co.—Liquor Plumb. Diacet. f ℥ij instead of ℥iij.

Confect. Aromat.—Besides the error pointed out by your correspondent, viz. its being kept in the wet state, Testæ præpar. are ordered instead of Creta præpar.

Confect. Cassiæ.—Syr. Rosæ f ℥viij is ordered by the Pharmacopœia, whilst the Conspectus has Oſs.

Conject. Sennæ.—The College orders Oiij

of water, but Dr. Thompson increases it to Oiv.

Decoct. Amyli.—Omitted.

Emplast. Saponis.—lb.ij of the emp. plumbi, instead of lb.iij.

Enema Opii.—mxx of tinct. opii, instead of mxxx.

Ferri-ammonio-chlorid.—is called ferri-potassio-chlorid.

Liq. Ammoniæ Sesquicarh.—℥viij of the Sesquicarh. in the place of ℥iv.

Liq. Hydrarg. Bichlor.—g.viij of the hydrarg. hichlor. and ammoniæ hydrochlor. in the place of g. x.

Liquor Potassæ.—Potassæ carh. g. x, instead of g. xv.

Mel Rosæ.—Oiſs of water, ordered in the Conspectus, instead of Oiiſs.

Mist. Spir. Vini Gall.—℥ſs of sugar left out.

Plumhi Acetas.—The Conspectus orders lb.j of plumhi oxid. and the College lb.iv, and ℥ij.

Spir. Ætheris Nit.—lb.ij of alcohol, instead of lh.iij.

Tinct. Balsami Tolut.—According to Dr. Thompson, there is not such a thing in the London Pharmacopœia.

Tinct. Colchic. Co.—Omitted.

Tinct. Opii.—Proof spirit ordered for rectified.

Unguent. Creosoti.—℥j of creosote ordered for ℥ſs.

Unguent. Gallæ Co.—Ounces of galls ordered instead of drachms.

Unguent. Hydrarg. Nit.—Drachms of olium olivæ ordered for ounces.

Besides the above there are many others; such as, retaining the old names, which he does oftener than adopt the new; confounding the names of the Colleges; leaving out some of the officinal preparations, &c. &c. But as these mistakes are of minor importance, and not calculated to lead into error, I will not occupy any more of your valuahle space; fearing I have encroached too much already. But as the above only relate to the London Pharmacopœia, I will, with your permission, send you another communication next month, detailing the errors as regard the Edinhurgh and Dublin Pharmacopœiæ.

NEW AND MORE SCIENTIFIC PROCESS OF MAKING THE EMPLASTRUM PLUMBI PROTOXIDI.

BY CHARLES WATT.

The Pharmacopœia of the London College of Physicians, in the formula for compounding this plaster, and, indeed, for making most other chemical preparations, which are employed in medicine, presents a melancholy evidence of the grossest ignorance of chemical principles, on the part of those to whom its compilation is confided. For this there is no excuse—they are bound to acquire adequate knowledge of the subject; or, if they possess it not, to refer, for revision, to those who are able to set them right. The directions given by them for the formation of the plaster of oxide of lead, is totally at variance with the laws by which its components unite, and the quantities ordered are such as it is utterly impossible can he combined. In fact, the whole formula shews perfect ignorance of the actions which take place in the union of the constituents, as well as of the nature of the compound when formed.

In the process of making this plaster, the oxide of lead, in the form of a hydrate, unites with the olive oil in consequence of the change that substance undergoes during the boiling, viz. its conversion into oleïc and stearic acids, a change which is precisely the same as that which takes place when oils or fats are converted into soap by the action of an alkali, as was first discovered by Chevreul. It is manifest, therefore, that the oxide of lead combines in definite, and in no other proportions.

The formula of the College is,—Oxide of lead, five pounds; olive oil, one gallon; water, two pints. Suspecting great inaccuracy, we have made the most careful analysis, and found the composition of the plaster to be oleïc and stearic acids, two pounds and one-third; oxide of lead, one pound. On proceeding synthetically, we observed that in these, and in no other proportions, could they be combined. Feeling much for the lahor caused to the operator in endeavouring to combine all the lead with the oil, and seeing the whole process to be a sad specimen of pharmaceutical chemistry, we adopted the following method as one far more simple and practicable. As the oil must be converted into the fat acids before it can unite with it, we boiled the olive oil with a small quantity of lime, until, on cooling, the compound was quite brittle;* we then separated the lime by dilute sulphuric acid, and left the whole to settle. When the oil had become perfectly free, we let off the water and sulphuric acid, and then added a corresponding proportion of oxide lead, as before stated, viz. to every two and one-third pounds, one pound of oxide thus prepared, namely, hy precipitating it from its solution in nitric or acetic acids† by a caustic earth or alkali,

* Brittleness, when the compound is cool, is a proof of the completion of the saponification.

† Nitric acid, diluted with ahout six times its weight of water, when hot, dissolves a large quantity of protoxide of lead, and be-

and well washing it to remove any adhering salt. We boiled the two components in a wooden vessel provided with a leaden steam-pipe, and the plaster was formed of a much more beautiful color and texture, and with perfect ease as regards the operation.

The whole process, *i.e.* the boiling with lime, the separating it by sulphuric acid, and the subsequent formation of the plaster, may be conducted on the usual apparatus, but we prefer the above, which is precisely such as is used for making the stearine for candles.

EXPERIMENTS ON POISONING BY ARSENIC; MADE BEFORE THE ROYAL ACADEMY OF MEDICINE.

BY M. ORFILA.

M. Orfila proposed to prove in four sittings: — 1st. That arsenious acid and stibial tartar, introduced into the digestive canal, or placed on the subcutaneous cellular tissue, are absorbed, mixed with the blood, and carried into all the organs of the animal economy: 2nd. That they remain for a certain time in the viscera and muscles, where their presence may be demonstrated; but that from the commencement of the poisoning, a part of the absorbed portion abandons these tissues, and is eliminated by the urine. 3rd. That this elimination, much more rapid in the case of stibial tartar than in that of arsenious acid, continues for several days, and until the tissues in question are quite free from those poisons: 4th. That it is, therefore, advantageous, and even indispensable, in the treatment of poisoning by these substances, to favor the secretion of urine: 5th. That it is possible in many cases to distinguish whether the arsenious acid or stibial tartar, extracted from the viscera of a subject, have been absorbed during life, or whether they have arrived in those viscera in consequence of a *post mortem* imbibition: 6th. That the best processes for detecting the small quantities of these poisons absorbed consist in destroying the greater part or the whole of the organic matters, in carbonising them by means of nitric acid, or in decomposing them by nitrate of potassa, and in introducing the products into the modified Marsh's apparatus: 7th. That it is always easy to distinguish arsenic from antimony, under the form of stains, and to ascertain that these stains do not arise, either from the apparatus or from the chemical agents employed: 8th. That there exists in the bones of man and of many animals, an arsenical compound insoluble in water: 9th. That there may be extracted from the muscular flesh of man a matter which he thinks is formed of a very minute proportion of arsenic, of sulphur, and an organic substance: 10th. That there is found in the soils of certain cemeteries, and other burying-grounds, infinitely small quantities of arsenic which boiling water does not dissolve: 11th. Finally, that we may easily, in a medico-legal case, avoid the errors to which the presence of arsenic in the bones, the muscles and in the soils of certain cemeteries, would seem at first to have given rise.

Want of space prevents us from giving in this number the whole of the experiments made at the four sittings of the Academy of Medicine: we therefore give those made at the first and second,—reserving the third and fourth for future insertion.

First Sitting; *October* 25, 1840.

The sitting was opened at a quarter past ten. M. Orfila explained the plan which he proposed to follow in his demonstrations. He detached the œsaphogus of a small white dog. He tied the conduit, and announced that the ligature would be maintained until two o'clock on the following day, and that the dog would be kept until the sitting of the 2nd of November, to show that he had not been greatly incommoded by the operation.

Into the stomach of a moderate sized and very healthy dog was introduced sixty centigrammes of arsenious acid dissolved in a hundred and fifty grammes of water: the necessary ligature was effected.

On the subcutaneous cellular tissue of another dog was applied, fifteen centigrammes of finely powdered arsenious acid: the edges of the wound were united by some points of suture.

Another dog was poisoned like the preceding with fifteen centigrammes of stibial tartar.

A dog was hung without being poisoned. He was immediately opened, and the liver, the spleen, the kidneys, the heart and the lungs were taken out and dried. The dry product was carbonised in a new porcelain capsule, with three times its weight of concentrated pure nitric acid, marking forty-one degrees of the areometer. The carbon obtained was treated for twenty minutes by boiling distilled water: the filtered liquor, which was of a reddish color, was put into a Marsh's apparatus, previously tried; it did not yield any arsenical or other stain, even at the expiration of half an hour.

At half-past ten, six kilogrammes of the

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comes a dinitrate; and acetic acid boiled with the oxide, also takes up a very large portion: from either of these solutions, the hydrate of lime, soda, or potassa, will precipitate it in the form of a beautiful hydrated protoxide.

muscular flesh of man were set on to boil, in a large porcelain capsule, with distilled water, and an ounce of alcoholized potassa.

There was also boiled with water, in a porcelain capsule, the liver of an adult cut in small pieces.

The bones of man were calcined at a high temperature and at a lower one: these bones, rendered friable, were powdered and sifted: the first gave a white powder, and the other, a black one: eight ounces of each of these were decomposed in two porcelain capsules, by four ounces of pure sulphuric acid and water. These mixtures were left to themselves for some days.

In two hours and a quarter, the poisoned dog not being dead, he was hanged, and, immediately after death, the bladder, containing about twenty-four grammes of urine, was extracted; the liver was separated without injuring the digestive canal. The quarter of this liver was dried and carbonised by nitric acid, as the viscera of the normal dog had been. The carbon obtained was boiled for twenty minutes with distilled water. It was filtered: the liquid, which was of a reddish color, was scarcely introduced into Marsh's apparatus, previously tried, as in the last instance, when it yielded numerous large brown and shining arsenical stains. The urine of this animal gave yellow shining arsenical stains, when put in Marsh's apparatus with a quantity of olive oil; this apparatus yielded no arsenic before the urine was introduced.

The urine of the unpoisoned dog, treated in the same manner, gave no trace of arsenic.

Marsh's Apparatus.—Some zinc and distilled sulphuric acid were introduced into a flask of water: hydrogen gas was disengaged for about an hour; the flame was very nearly two lines, and not the slightest trace of arsenic was obtained on the porcelain plates.

Another apparatus, into which some of the same sulphuric acid and zinc were introduced, acted for ten minutes without yielding arsenic, but at the very instant a drop of a concentrated solution of arsenious acid was added, numerous large brown arsenical stains were deposited on the plate.

Into a flask filled with hydro-sulphuric acid gas, was introduced a mixture of two parts of water and one part of pure sulphuric acid: nothing but milk-white sulphur was precipitated, whilst the same mixture, with a drop of a solution of arsenious acid previously added, gave a canary yellow precipitate of sulphuret of arsenic.

Characters of Arsenical and Antimonial Stains.—Arsenical stains present a very different appearance from antimonial ones; the first, submitted to the action of the flame of pure hydrogen, were almost instantly volatilised; they were spread, became less intense, and have remained even for some minutes. Both immediately disappeared by the action of pure and concentrated nitric acid, and, by evaporating the liquors, we obtain with the arsenical stains, a residue of a yellowish white, and, with antimonial stains, a yellow residue. The capsules were left to cool, and the two residues were touched with neutral nitrate of silver; the arsenical residue gave a brick-red arseniate of silver, whilst the antimonial product was unaltered.

An ounce of dry gelatine was heated with an equal quantity of pure nitric acid at 41°; six minutes scarcely elapsed before a very fine carbon was obtained.

MM. Husson and Pelletier, members of the commission, assisted in all the experiments which were made from a quarter past ten until the sitting rose, at a quarter past four. The products of the different operations which could not be finished in the day, were put under seal, and confided to M. Husson.

Second Sitting; *October 26th*, 1840.

1st. At nine o'clock in the morning, in presence of MM. Husson, Amusat, Caventou, &c., and after having inspected the seals, the different capsules containing the residues of the operations of the day before were drawn from the cabinet in which they had been placed.

2nd. The decoction of the muscular flesh made by five hours' boiling was strained through a fine cloth; it was evaporated to dryness, and carbonised with pure concentrated nitric acid; the carbon was put in contact with boiling distilled water, for twenty minutes, the liquor was filtered and kept, after being ticketed.

3rd. The decoction prepared the day before with the liver of a human adult who had not been poisoned, was also passed through a cloth; it was evaporated, after having mixed with it sixty grammes of pure nitre from the laboratory of the faculty. The dried product was burned in a Hessian crucible reddened in the fire. The remaining solid matter was dissolved in water, and decomposed by pure sulphuric acid: the liquid after being boiled for an hour, was kept to be tried afterwards.

4th. Three-quarters of the liver of the animal, poisoned the night before by sixty centigrammes of arsenious acid, was boiled for three hours, in a porcelain capsule, with distilled water. The decoction, strained through a cloth, and mixed with sixty grammes of pure nitre of the laboratory, was evaporated to dryness, and burnt in a new Hessian crucible, reddened in the fire. The mass resulting from this combustion was treated with water and pure sulphuric

acid, like the preceding. The liquid was set aside and kept.

5th. At nine o'clock a moderate-sized dog was poisoned, by introducing into his stomach sixty centigrammes of stibial tartar, dissolved in a hundred and fifty grammes of water. The necessary ligatures were made: in an hour and three-quarters, the animal not being dead, was hanged. The bladder contained scarcely six grammes of urine, which was collected. Half the liver of this dog was dried and carbonised. The carbon was treated for a quarter of an hour by pure hydrochloric acid, mixed with a fourth of its weight of water. The filtered liquid was kept. The urine of this animal (six grammes) evaporated to dryness and carbonised, was subjected to the action of boiling hydrochloric acid, diluted with a fourth of its weight of water. The filtered liquid was preserved.

6th. In the same way was treated a hundred and fifty grammes of urine from the dog poisoned the day before by fifteen centigrammes of stibial tartar applied to the subcutaneous cellular tissue of the thigh. This dog not being dead at 10 o'clock, was hanged.

7th. At ten o'clock in the morning, M.—— having furnished five hundred grammes of crystallised nitre, and as much nitre in mass; these two nitres were pulverised and mixed together in a marble mortar. Half of this mixture was decomposed by four hundred and forty-eight grammes of pure and concentrated sulphuric acid, in a porcelain capsule, with the aid of heat. The liquor, diluted with water and filtered, was set aside. The other half of this nitre was treated in the same manner after a centigramme of arsenic acid had been added to it.

At two o'clock precisely, M. Orfila read the minutes of the proceedings at the last sitting, which being correct, were signed by the members of the commission. M. Orfila detached the ligature applied the day before to the white dog. This very lively animal, suffered syncope whilst they sought the ligature, which was situated very deep, on account of the swelling of the flesh, and of the already inflamed lips of the wound. The operation had been performed twenty-four hours previously.

Immediately after, the two liquors obtained with the nitric and sulphuric acid, (*vide* 7th) were introduced into two great Marsh's apparatus, previously tested: the disengagement of gas was so great, especially with the arsenical liquid, that it was necessary to remove half, and to add a considerable quantity of water. The gas was inflamed, and although the flame was strong, numerous large arsenical stains were deposited on the capsule. The other liquid, which had not been mixed with arsenic acid, was less acid than the preceding, because by boiling it had lost a greater quantity of sulphuric acid; on this account, it was hardly necessary to remove one-third of the liquor, which was replaced by water. The gas burnt with a flame of two or three lines, much weaker than that of the preceding liquid. It was was impossible to obtain the slightest stain of arsenic, or indeed any other stain.

The liquor No. 2, arising from the muscular flesh, placed in a Marsh's apparatus, gave with difficulty, some large, white, opaque stains, and a few other brown, dull stains.

The liquor No. 3, arising from the normal liver, put in an apparatus previously tested, yielded no stain: the flame was good.

The liquid No. 4, obtained with three quarters of the liver of the animal poisoned the day before with sixty centigrammes of arsenious acid, introduced into a Marsh's apparatus, previously tested, gave a great many brown shining stains.

The six grammes of urine from the dog poised in the morning, furnished no antimony (*vide* 5th.)

The half of the liver of that animal gave a liquid (*vide* 5th), which, being put in a Marsh's apparatus, almost immediately yielded numerous large antimonial stains.

The liquid arising from the urine of the dog poisoned by fifteen centigrammes of stibial tartar, applied to the thigh (*vide* No. 6), was scarcely introduced into a Marsh's apparatus, when it gave a prodigious quantity of antimonial stains.

The dog poisoned the day before by fifteen centigrammes of arsenious acid applied to the subcutaneous cellular tissue of the thigh, died during the night. The bladder was empty, although the animal had not made water. This organ was washed with distilled water, and the liquid was put in a Marsh's apparatus, with about two ounces of olive oil. In a few minutes, three or four small yellow shining stains were obtained, which were evidently arsenical.

The sitting rose at a quarter to four, and the two capsules containing the bones calcined on the 25th, were put under seal.

M. Orfila explained the necessary processes:—

1st. To disengage arsenic from antimony, when the individual poisoned had been treated with stibial tartar:

2nd. To discover whether or not in a case where an individual has been poisoned by arsenious acid, and treated by peroxide of iron, the arsenical stains arise from the peroxide used as a counter-poison.

3rd. Whether in the case where the soil of a cemetery contains arsenic, this substance can be communicated to the body.

4th. Whether the ingestion of arsenious

acid into a body can determine an imbibition of a nature to give the same phenomena as produced by poisoning.

ERGOT OF RYE IN PREMATURE LABOUR.*

BY JOSEPH HODGSON.

Mrs. M., residing at Salvador House, Bishopsgate-street; of fair complexion, and other general characteristics of the strumous diathesis; has been married eight years, and is now thirty-four years of age; within twelve months of her marriage, at the full period of gestation, after a tedious labour of forty-eight hours, she was delivered of a living female child. Two years subsequently she miscarried, at the fourth month; and then, after eighteen months, gave birth to a still-born child at the seventh month.

On the 17th of May, 1839, she came under my observation, being again threatened with premature labour, at the seventh month, which was averted by placing her under favourable circumstances, and her pregnancy continued to the eighth month, when labour came on, and, after seven hours, the breech descended with the abdomen towards the sacrum; but, notwithstanding the chin was depressed upon the chest, I could not succeed in extracting the head without lessening it, by the operation of craniotomy.

Taking all the circumstances into consideration, and being of opinion that the pelvis had contracted in size, I desired my patient, the next time she became pregnant, to inform me at the seventh month, in order that I might have an opportunity of bringing on labour at that time, as the only likely means of insuring the birth of a living child. Accordingly, in the middle of November, she informed me that she was then pregnant, and could trace her pregnancy from the middle of June. She continued in very good health during the remainder of the time, up to the 16th of January last, when I found her in good spirits.

Noon, January 16. I prescribed ten grains of ergot of rye every four hours, to the extent of six doses; visited her at nine o'clock in the evening, one hour after taking the third dose. She stated that every dose produced pains in the back, which continued about half an hour, or from that to three-quarters.

17th, 10, A.M. She had taken the sixth and last dose of the medicine, which at that time was causing her pain, and on making an examination, I found the os uteri softened, and readily admitting one finger, and then a second, between which I passed the stilet of the female catheter, and ruptured the membranes, presentation natural, and the child's movements distinctly felt. I then returned home, requesting to be called when pains came on. 5, P.M. Seven hours from the time the membranes were ruptured, and os uteri fully dilated, the pains became regular, but having waited until half-past seven, and being quite satisfied that they were insufficient to complete the delivery, and also fearing the child would be destroyed by the pressure of the uterus, I mixed 3j of ergot of rye in 3iv of water, and ordered one-third to be given every ten minutes, until the uterus acted vigorously; it was not before the third dose had been exhibited that any great increase of uterine action took place, and then, at the end of an hour, a living female child was expelled, which, with the mother, is now doing well.

Remarks.—The exhibition of the secale cornutum, previously to rupturing the membranes by mechanical means, appears to soften the os uteri, and generally to stimulate the action of that organ; and the practice accords with that recommended by Dr. F. H. Ramsbotham, in his valuable work, now in course of publication.

The novel feature in this case is the renewed administration of the secale after the evacuation of the liquor amnii, when the uterus was powerfully contracting, but its expulsive action feeble.

I attribute the preservation of the life of the infant to such administration; an opinion in which Dr. R. fully concurs.

* From *The Lancet*.

IODIDE OF POTASSIUM IN SYPHILIS.

Mr. ROBINS detailed to the Westminster Medical Society, at its meeting on the 7th of November, 1840, a case of "veuereal sores," treated by mercury, and followed by secondary symptoms, which gave way under the use of sarsaparilla, iodide of potassium, and Plummer's pill. He put some questions to the society in reference to the relative value of these agents in syphilitic diseases.

Mr. WINSLOW had found the iodide of potassium of much service, both in primary and secondary syphilis.

Mr. H. JOHNSON had used the iodide of potassium in primary sores, and had not been satisfied with the results. He had found, however, that it was of much service in cases of irritable phagedænic kinds of ulceration, which were the sequelæ of syphilis, and connected with a cachectic state of the system.

Mr. RUTHERFORD ALCOCK had also little

faith in the iodide of potassium as a remedy in the primary forms of syphilis. In the secondary symptoms of the disease occurring in cachectic habits, particularly in affections of the joints and periosteum, he had found it of great service. He believed that this medicine acted as a powerful and beneficent alterative.

Dr. Addison inquired, if any member had seen the dingy papular eruption, generally considered as a secondary symptom of syphilis in any case in which that poison had not entered into the system. He had always found it to be the result of such a poison.

Mr. H. Johnson had seen it in many cases, in which he firmly believed that it was the result of mercury alone.

BOOKS RECEIVED.

The Seventh Annual Report of the Royal Cornwall Polytechnic Society, 1839. Falmouth: Jane Frathan, Market-street. London: Simpkin and Marshall.

Griffin's Scientific Miscellany, No. V. Instructions for the discrimination of Minerals by Simple Chemical Experiments. By Franz Von Kobell, Professor of Mineralogy in the University of Munich. Translated from the German, by Robert Corbet Campbell. Glasgow: R. Griffin & Co. Tegg, London.

[We purpose reviewing this in our next: it came too late for the present number.]

The Touchstone of Medical Reform; in Three Letters addressed to Sir Robert Harry Inglis, Bart. M.P. By Joseph Henry Green, F.R.S., Professor of Anatomy to the Royal Academy; one of the Surgeons of St. Thomas's Hospital, &c. London: S. Highley, Fleet-street, 1841.

TO CORRESPONDENTS.

Mr. Osborn and Mr. Viper in our next.

A Subscriber is informed that The Chemist is always ready in sufficient time to reach Nottingham on the day of publication: if it does not do so, the fault never rests with us.

B. B. and J. G. are unavoidably deferred until next month.

An Abridgement of Mr. Hawes's Bill was given in The Chemist, No. XII.

"A Subscriber to The Chemist" is informed that he would be compelled to undergo an examination previous to going into business under the circumstances he mentions.

A Subscriber and Well-Wisher.—It is not usual to do so.

Mr. Harper and Mr. Brewin will have received private communications.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

ERRATA.—No. XIV.

Page 54, column 1, line 39,—for "predicaments" read "medicaments."

Page 54, column 2, note,—read thus—"Such attention to serve his profession would elevate him more than can any acts of the legislature, which would best protect the interests of society, by compelling him to increase his stock of knowledge, or at once to merge him into his origin—the chemist and druggist. Ledgers and day-books are not the companions of scientific research," &c. &c.

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THE CHEMIST.

I. CHEMISTRY.

INVESTIGATIONS CONCERNING ULMIC ACID.*

BY EUGÈNE PÉLIGOT.

Most non-volatile organic matters, submitted to the action of chemical agents endowed with the most powerful affinities, before arriving at ultimate decomposition, undergo a kind of alteration which converts them into substances of a black or brown color, soluble in water or the alkalis. The action of heat, properly applied, converts sugar into caramel, and tannin into metagallic acid, and starch, gum, and tartaric and citric acids undergo similar alterations: potassa heated with wood changes it into a black acid, soluble in the alkalis: sulpburic acid blackens sugar, without heat, and under the influence of water and prolonged boiling, produces, like most other acids, a brown substance. Indeed, the spontaneous destruction of vegetables engenders a brown body, which nature presents us with in abundance, in turf, in the soil, in the dunghill, and in the various substances which, under the names of catechu, umber, sepia, &c., are employed as coloring matters.

Vauquelin first drew the attention of chemists to the brown substance which exudes from the ulcers of certain trees, and particularly the elm. Thomson gave this matter the name of *ulmine*.

In the remarkable memoir, on the properties of wood, which he published in 1819, M. Braconnot acquainted us with the conversion of this body into ulmine, under the influence of heat and caustic potassa. At the same time he gave the principal characteristics of this substance, which he considered as identical with the matter noticed by Vauquelin.

In a dissertation on ulmine, which he published in 1830, M. Polydore Boullay added much to our knowledge of this substance: he put beyond doubt its property of combining with bases, and he assigned it, in consequence, the name of *ulmic acid*: moreover, he undertook the determination of its constituent elements, and of its atomic weight.

In continuing my investigations concerning saccharine matters, I was led to study, *de novo*, the brown matters produced by the contact of sugar of starch with the alkalis. I have shown in a former memoir that it contains more carbon than exists in ulmic acid, according to known analyses: in endeavouring to study these two substances comparatively, I thought I perceived that much remained to be done with regard to *ulmic* acid itself, and that all the substances designated by that name were far from presenting the same characteristics: it appeared to me, besides, that now it became more easy to follow into their different phases the various transformations which organic bodies undergo, we cannot admit, at least without decisive proofs, the formation of a single and similar substance, as a consequence of various, and sometimes opposed, circumstances. How, in fact, is the formation of ulmic acid, sometimes under the influence of caustic alkalis, sometimes by the action of the more powerful acids, and at other times, by the simple effect of a kind of fermentation, by a spontaneous decomposition, to be explained? Thus, notwithstanding the proper confidence inspired by the names of the chemists, whom I have mentioned, I thought it advisable to try some experiments on the various black matters designated or confounded by the name of ulmine or ulmic acid.

M. Braconnot prepared artificial ulmine by heating in a silver crucible equal parts of caustic potassa and saw-dust, moistened with a little water. At a certain temperature, the mixture, which was kept stirred, became soft and pasty, and swelled up very much: when the crucible was removed from the fire, and water poured in, almost all the matter

* *Annales de Chimie et de Physique*; vol. lxxiii., p. 203.

was dissolved, and constituted a brown liquor, from which an acid separated ulmic acid, which precipitated under the form of brown flocks, which were washed in a large quantity of water, for this acid is insoluble in water.

In the dry state, it was of a brilliant black, like coal: it very readily dissolved in alcohol; it formed soluble salts with potassa, soda, and ammonia, and completely neutralised the alkaline properties of those bases.

M. Braconnot's process readily produces ulmic acid: nevertheless, on account of the tumefaction of the mixture, at a certain stage of the operation, which tumefaction is owing to a disengagement of hydrogen gas, as M. Chevreul observed, but little ulmate of potassa can be obtained in one operation. I have found it infinitely more convenient to prepare it in a spacious vessel, such as a silver or cast-iron basin: thus may be obtained, in a few minutes, a great quantity of ulmate of potassa.

M. Braconnot admits that wood, in being converted into ulmic acid, simply allows a portion of its oxygen and hydrogen to be disengaged in the state of water, and this is changed into a substance in which carbon alone becomes predominant. Thus, according to that able chemist, the composition of ulmic acid is represented by that of wood, minus a certain quantity of water, which, according to him, is the only essential product formed in the reaction. M. P. Boullay determined the composition of ulmic acid prepared by M. Braconnot's process, and he found that it was formed of

Carbon	56·7
Oxygen and hydrogen, in the proportions to form water . .	43·3
	100·0

The formula $C^{60}\ H^{30}\ O^{15}$ would represent the atomic weight of this acid.

Since M. Braconnot's experiments, M. Chevreul has shown that wood and potassa give with water, after having been heated, a solution which becomes brown only under the influence of the oxygen of the atmosphere. From this experiment it has been concluded that the presence of air is necessary for the formation of ulmic acid.

I endeavoured to confirm with all possible care, the results which I have just related, and my experiments have often been at variance with existing opinions concerning the formation and composition of ulmic acid.

To obtain the ulmic acid which I have used in my experiments, I employed very fine saw-dust, perfectly freed, by the alternate action of water, alcohol, acids and alkalis, from the various substances soluble in those agents and foreign to the constitution of wood. In precipitating, by means of a mineral acid, the ulmic acid from its combination with potassa directly obtained with the proportions and precautions indicated by M. Braconnot, I immediately perceived that there existed very perceptible differences in the color of the acids furnished by different successive operations. The product obtained was sometimes black, sometimes brown, and at other times of a yellowish grey.

I set about ascertaining the causes of this variation of color. At first I thought they depended solely on the more or less complete absorption of oxygen during the formation of the ulmate of potassa: but this opinion does not appear correct, for I have proved that the time during which the operation lasts in contact with the air has no very perceptible influence on the color of the product.

This difference of color is owing to the more or less elevated temperature to which the potassa and saw-dust are exposed. I obtained at pleasure, with the same substances, a product of a very light chamois color, and ulmic acid as black as coal.

If it be wished to produce the substance almost colorless, the mixture must be slowly heated to a moderate degree, taking care to keep it constantly stirred, to avoid the unequal distribution of heat: when the matter begins to soften, it is removed further from the fire, continuing to mix it with an iron spatula. On afterwards treating it with cold water, a portion of the ligneous matter remained unattacked: another portion formed with the potassa a combination which, although brown when dissolved and exposed to the air, yields, on decomposition by a mineral acid, a yellowish precipitate which must be washed in warm or tepid water; for this body melts in hot water, and when once melted, it is very difficult to wash it further.

This product may be obtained with still greater facility by using two parts of saw-dust and one part of potassa, instead of equal parts: the fusion of the mixture being slower, enables one to govern the operation, and it becomes very difficult to exceed this first phase of the alteration of the wood.

True ulmic acid, that is to say, the blackest, is always obtained identical, by operating in the opposite manner. The mixture must be strongly heated, and the action of the heat must even be prolonged, so as to decompose a portion of the ulmate of potassa produced: the aqueous solution of the residue then furnishes, by an acid, a precipitate which should be black. When it is not black, the acid must be again heated with a fresh quantity of potassa, then separated and purified in the same manner.

Thus prepared, black ulmic acid, dried at 126° C., *in vacuo*, gave by analysis the following results:—

	*(1)	(2)	(3)	(4)	(5)	(6)
Carbon	72·3	71·5	72·1	72·1	72·3	72·0
Hydrogen	6·2	6·1	5·8	6·3	6·0	7·4
Oxygen	21·5	22·5	22·1	22·6	21·7	21·6
	100·0	100·0	100·0	100·0	100·0	100·0

It is well understood that these analyses were made on products resulting from different preparations.

If these analyses are correct, they tend to prove that ulmic acid has an elementary composition, and a constitution, very different from those deduced from the experiments made previous to mine.

In fact, this acid contains, according to the preceding analyses, 14·7 per cent. of carbon more than M. P. Boullay found.

Besides, it contains more hydrogen than is required to form water with its oxygen: M. Braconnot's theory of its production, therefore, becomes totally inadmissible.

It is evident to me that the very great differences between M. Boullay's analyses and mine are owing to the impossibility of completely burning the ulmic acid in the analytical apparatus employed by him. I do not think that in the whole organic kingdom, there is a substance more difficult to burn with oxide of copper than ulmic acid: in the bad glass tubes employed by chemists some years ago, this combustion must of necessity have been incomplete. The tube would be fused before the conclusion of the experiment, so that it could not be finished. It is only since we have had much less fusible glass tubes, that analyses of this kind have become possible. I do not pretend that they are easy; for the addition of chlorate of potassa mixed with the matter to be analysed, appeared to me indispensable for combustion to be with certainty effected: without this addition, the analysis of the ulmate of silver itself almost always shows a loss of 3 or 4 per cent. of carbon.

With respect to the 2 per cent. of hydrogen which I have obtained more than M. Boullay, it is easily accounted for, by remembering that the oxygen being proportioned by loss, its quantity is found surcharged with that of unburnt carbon, and may therefore attain the proportion of the elements of water with the hydrogen directly obtained. Nearly as we agree concerning this direct determination of hydrogen in the state of water, it does not the less result from my analyses that ulmic acid contains one half more hydrogen than is necessary for forming water with its oxygen.

It is also possible that M. Boullay may have analysed a mixture of the two products which may be formed in the treatment of wood by potassa: now the yellow product contains 7 or 8 per cent. of carbon less than that we have just been speaking of, as shown by the following analyses:—

Chamois yellow acid dried at 100° C[1]			
Carbon .	65·3	67·6	65·9
Hydrogen .	6·3	6·2	lost.
Oxygen .	28·9	26·2	
	101·0	100·0	

I do not think, however, that this product, as I have obtained it, should be considered as a pure substance: nor do I here insist on its analyses and properties; the low temperature at which this body is formed may allow the different substances resulting from the action of heat on the wood, to remain in it; M. Payen's observations concerning the latter body also show that it is of a complex nature, formed of several distinct substances which, doubtless, must be separately treated by potassa, to obtain in a state of greater purity a body of so immediate a derivation.

With black ulmic acid, I think that it is otherwise: at the very high temperature at which the ulmate of potassa is produced and maintained, it does not appear that any other organic products can exist, and the different varieties of wood ought to produce the same body, which, besides, precedes their ultimate decomposition: I have always obtained an identical acid by employing wood procured from different sources.

After having determined the composition of this acid, I endeavoured to fix its atomic weight; but this was attended with difficulties very different from those of its elemen-

*(1)	Matter employed . . .	0·308
	Carbonic acid . . .	0·805
	Water	0·374
(2)	Matter employed . . .	0·296
	Carbonic acid . . .	0·765
	Water	0·164
(3)	Matter employed . . .	0.340
	Carbonic acid . . .	0.886
	Water	0·178
(4)	Matter employed . . .	0·322
	Carbonic acid . . .	0·840
	Water	0.183
(5)	Matter employed . . .	0·387
	Carbonic acid . . .	1·012
	Water	0·212
(6)	Matter employed . . .	0·205
	Carbonic acid . . .	0·534
	Water	0·119

tary analysis: I was unable, notwithstanding repeated trials, to obtain with certainty salts presenting an uniform quantity of base. However, in interpreting the composition of various salts of silver and potassa, I consider the following formula very probable as representing ulmic acid, free or combined with bases:—

C^{54} . . .	2066·0	72·3
H^{28} . . .	174·7	6·1
O^{6} . . .	600·0	22·6
	2840·7	101·0

This formula perfectly coincides with my analyses of the free acid.

By preparing, with the greatest possible care, ulmate of silver by double decomposition, by means of nitrate of silver and ulmate of ammonia containing a slight excess of ammonia, I obtained, by calcining the salt which had been well washed and dried:—

	I.	II.
Silver . .	31·3	31·5

I. 0·781 of ulmate of silver gave 0·151 silver;

II. 0·633 of ulmate of silver gave 0·200 silver.

Now the formula $C^{54}\ H^{28}\ O^{6}$, Ag O gives by calcination 31·6 of silver: the elementary analysis of this salt seems to indicate that the free acid does not lose water in combining with bases.

The ulmate of potassa which I analysed was prepared pure potassa and ulmic acid in excess: the soluble compound was evaporated *in vacuo*, and dried at 120° C.: it yielded 16·8 per cent. of potassa; the formula $C^{54}\ H^{28}\ O^{6}$, KO supposes 17·1.

The difficulties which I met with in the preparation of the ulmates as definite and uniform bodies, are owing, in my opinion, partly to the insoluhility of ulmic acid in water; and partly, to its little energy as an acid: moreover, this body acts, in all respects, like a coloring matter. It attaches itself to all bodies presented to it, and has a tendency to form a kind of lac with various metallic oxides: the alkaline ulmates themselves, although soluble in pure water, become insoluble in impure water; which explains why, in the double decompositions formed by these salts, different salts are obtained with the same liquors accordiug as they are more or less concentrated. It is well known how difficult it is to determine the atomic weight of coloring matters.

It remains for me to explain the manner in which ulmic acid is formed, hy the contact of ligneous matter with potassa. I have made many experiments which appear to me to throw some light on this subject, complicated as it appears.

We know that the production of ulmate of potassa is always accompanied hy a disengagement of hydrogen. We have just seen that the acid obtained contains much more hydrogen than is required to represent water with the oxygen which it contains. Finally, it is admitted, that the contact of air is necessary in this reaction.

I endeavoured to verify the latter point, and the following experiments seem to me of a nature to put it heyond douht. I heated in a glass matrass equal parts of potassa and wood, moistened with a large quantity of water: the matrass was furnished with a tube dipping into mercury. As the reaction commences only after the disengagement of the water in the state of vapor, I considered that the air would he expelled hy the steam: however, by continuing the heat, ulmate of potassa was formed. But this mode of operation was unsatisfactory, on account of the impossihility of stirring the mixture, and of obtaining an almost uniform heat in the mass. I also endeavoured to avoid this cause of error, hy introducing into the matrass, with the potassa and moistened wood, one or two kilogrammes of mercury. This metal, directly receiving the heat of the furnace, transmitted it with more equality to the mixture: hy gradually heating the mercury to boiling, air and steam were at first disengaged. Then hydrogen in great ahundance. The product remaining in the matrass was completely soluble in water: it was ulmate of potassa.

This experiment, which has been several times repeated, has always furnished very clear results: the product, precipitated hy an acid, was always hrown or hlack, according as the temperature to which the mixture was suhjected was more or less intense.

Independently of the hydrogen, oily suhstances are produced, which remain partly in the matrass mixed with the ulmic acid: hesides which a great quantity of pyroxylic spirit is formed, and is distilled over with the water.

Black ulmic acid is formed, therefore, without the intervention of the oxygen of the air: this conclusion is in noway at variance with M. Chevreul's experiment ahovementioned; for that celehrated chemist seems to have heen one of the first who studied the products of the alteration of wood by potassa, which has formed with water a colorless solution, which became colored in the air. I do not think that M. Chevreul examined the nature of the free acid, and I have every reason to helieve that it was not so hlack as that studied in this memoir.

From the composition of wood, and considering the excess of hydrogen which ulmic acid contains relative to that body, it became prohahle that it would form, at the same time, a complementary suhstance, containing more oxygen than exists in wood and ulmic acid.

I have ascertained that this complementary body undergoes successive transformations, and that it consists, according to the temperature at which it is produced, of formiate, oxalate, or carbonate of potassa.

If, indeed, the liquor from which has been separated the yellow insoluble matter that precedes the formation of the ulmic acid, be distilled with sulphuric acid, there passes over an acid which reduces the salts of silver and mercury with the greatest facility: it is formic acid.

When we operate so as to obtain real ulmate of potassa, if the brown liquor obtained be evaporated without previously precipitating the ulmic from it by an acid, a very abundant crystallization of oxalate of potassa is obtained.

M. Gay-Lussac has long since remarked the formation of oxalic acid, under similar circumstances.

Finally, if the temperature has been too high, carbonate of potassa is produced.

The existence of these complementary products being proved, it is easy to explain the disengagement of hydrogen: it is owing to the successive conversion of formiate into oxalate of potassa, and of the oxalate into carbouate of the same base.

Direct experiment has, indeed, shewn me that, by heating formiate of potassa with an excess of alkali, at a moderate temperature, it is converted into the oxalate with a disengagement of hydrogen, as the following formula expresses:—

$C^4 H^2 O^3, K O = C^4 O, K O, + H^2$.

If, in its turn, oxalate of potassa be heated with hydrate of potassa, carbonate of that base is obtained, with a disengagement of hydrogen:—

$C^4 O^3, K O + K O, H^2 O = C^4 O^4, 2 K O + H.^2$

It is therefore clearly seen whence comes the hydrogen, in the course of the transformation of wood, under the influence of potassa, first, into a yellow product and formic acid, afterwards into ulmic and oxalic acids, finally into carbon and undetermined matters, and into carbonic acid. Ulmate of potassa may also exist at the temperature at which oxalic passes to the state of carbonic acid.

The production of two distinct acids in this action of potassa, goes into the nature of the ordinary alterations produced by this base on non-volatile organic substances.

It is evident that it would be easy for me to establisb the foregoing reactions, by atomic formulæ; but I think I ought to abstain from these chemical equations, not being sufficiently acquainted with the formula of ligneous matter, in the first place; and in the next, not having been able to determine the relative quantities of the two products of the reaction, on account of the difficulties to which I have already alluded.

Such are the results which the study of ulmic acid has furnished to me. In the discussion concerning the composition of this acid, it may be remarked that I have not spoken of M. Malaguti's recent work on the formation of ulmic acid by sugar and dilute acids: in his work, however, M. Malaguti gives an analysis which agrees with M. P. Boullay's results, and which, therefore, is very much at variance with mine: in fact, I have not paid much attention to this difference, having ascertained that the black product studied by M. Malaguti is not ulmic acid; it is insoluble in alcohol, whilst ulmic acid readily dissolves in it in large quantity. M. Malaguti, since my observations, has devoted himself to new investigations concerning the composition of the acid which he obtained.

I am, besides, in a situation to shew that the very numerous brown bodies which are at present confounded under the name of ulmic acid, are entirely distinct from that acid. The comparative study of the properties and composition of these different substances forms the subject of a work which I shall very soon have the honor of presenting to the Academy.

ON THE ELEMENTARY COMPOSITION OF CERTAIN SPECIES OF ANTHRACITE.*

BY M. JACQUELAIN.

Of all the combustible minerals which at different times have attracted the attention of chemists, coal, as much on account of its abundance as of its easy and varied uses, is the only species of combustible concerning the composition of which we now possess any accurate notions. We cannot but mention as a remarkable work on these substances, that of M. Karsten, and especially that of M. Regnault, and summing up with more justice the observations of Klaprotb, Thomson, and Héricart de Thury, who had tried too difficult analyses to be realised in their time.

Anthracite, on the contrary, as a most refractory combustible, seems to have been put aside in all these studies, or, at any rate, the few analyses that have been made show us only the proportions of carbon, ashes, and volatile matters proportioned by difference.

No one would now dare to dispute the numerous services for which we are indebted to investigations of elementary analyses made in great number, and comparatively applied to impure substances. As-

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surely it must tend to this end: but I am far from partaking the opinion of chemists, who would not see in the trials of these matters by fire, or by other agents, the possibility of acquiring some information respecting their intimate nature; I think, on the contrary, that both methods must be made use of. It is in this direction that I have undertaken the study of some kinds of anthracite. The following is the course which I adopted:—

The carbon, hydrogen, nitrogen and oxygen, were determined with all possible care, by the ordinary process of organic analysis.

The proportion of ashes was obtained by slow incineration in a muffle.

The presence of sulphur, arising from the pyrites, was easily detected, by acting on the combustible reduced to an impalpable powder, with *aqua regia*.

Finally, to ascertain the nature of the volatile products yielded by this anthracite at an elevated temperature, 60 grammes of the matter, in small pieces, free from dust, were put into a porcelain tube sealed at one end; the other end communicated by means of a safety tube with a flask containing alcohol, and furnished with a gas tube; the cylinder was placed horizontally in a forge, and the heat was continued until gas ceased to be produced. The latter having been fractioned, the different products were successively analysed over water; then, making a mixture of the latter, the analysis was recommenced over water and mercury, in order to see if the means agreed.

The action of aqueous chlorine on all these gases, and the eudiometrical analysis showed me that I had extracted from each anthracite, hydrogen mixed with a small quantity of carburetted hydrogen, capable of being converted into solid chloride of carbon. I shall show that the composition of this carburetted hydrogen corresponds with the state of condensation of methylene.

Finally, the mean of each very dry gaseous mixture being treated by melted potassium, there always resulted from it an absorption equal to the volume of free hydrogen supposed to exist in the mixture.

I.—Anthracite of Swansea.

Density=1.27.

Physical Properties.—Of a shining black, very compact lamellar structure, fracture rough in the direction of the superposition of the laminæ; homogeneous in all the samples, brittle, difficult to pulverise; its powder does not soil the fingers. This combustible burns without disaggregation, and without producing flames.

ANALYSIS OF THE FRACTIONED GAS.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	Total.
Gas employed	100	100	100	100	100	100	100	100	800
Oxygen employed	100	100	100	100	100	100	100	100	800
Residue after detonation and the action of potassa	28	23	28	38	42	43	49	50	301

	Calculated mean of partial analyses.	Analysis of the whole mixture over water.	Analysis of the whole mixture over mercury.
Gas employed	100	100	100
Oxygen employed	100	100	100
Residue after detonation	,,	,,	49
Residue after the action of potassa	37.62	39	37

Now we see that 12 volumes of carbonic acid represent ..... 12 of oxygen.
Again, there is for residue .. 37 ,,
Then the oxygen consumed is equal to 51, which corresponds with .....102 hydrogen.

Thus the gas analysed was composed of 88 parts of hydrogen, and about 12 parts of a bi-hydrocarbon; it is at least a consequence to which the action of potassium in a state of fusion on this mixture has led me, since there remained, after the absorption of the hydrogen, the twelve parts of bicarburetted hydrogen already mentioned.

Before devoting myself to this kind of counterproof, I ascertained by synthetical experiments, that potassium in fusion has no action on marsh gas, olefiant gas, and oil gas. I saw that hydrogen mixed in known proportions with each of these gases, completely disappeared and left intact the portion of carburetted hydrogen associated with it.

All chemists who are familiar with the analyses of gas will agree, I think, that the application of this property of potassium so well observed by MM. Gay-Lussac and Thenard, and which may be said to have fallen into oblivion, should become a prompt and certain means of isolating hydrogen from a mixture of carburetted hydrogen gas and marsh gas. In this respect, therefore, we have made a step towards the solution of a problem which has baffled many analysts.

Every correction made, 100 grammes of anthracite yielded 24 lit. of this gaseous mixture, at 0° and 76, *i. e.*, in weight 2 gr., 14 of hydrogen.

ELEMENTARY ANALYSIS.		INDUSTRIAL ANALYSIS.	
Ashes	1.72	1.72 } coke	91.62
Carbon	90.58	89.90 }	
Hydrogen	3.60	24 litres of gas at 0° and 76	
Nitrogen	0.29	33.3 reduced lead.	
Oxygen	3.81	Traces of sulphur.	
	100.00		

II. Anthracite of Sablé.

Density = 1.75.

PHYSICAL PROPERTIES.—Endowed with great lustre; sometimes tarnished and faintly variegated; conchoïdal fracture; easily pulverised; its powder does not soil the fingers. This combustible burns without being divided, and without producing flame.

ANALYSIS OF THE FRACTIONED GASEOUS PRODUCT.

	I.	II.	III.	IV.	Total.
Gas employed	100	100	100	100	400
Oxygen employed	100	100	100	100	400
Residue after the detonation and action of potassa	19	39	48	52	158

	Calculated mean of partial analyses.	Analysis of the whole mixture over water.	Analysis of the whole mixture over mercury.
Gas employed	100	100	100
Oxygen employed	100	100	100
Residue after detonation	,,	,,	48
Residue after potassa	39.5	39	38

But 10 volumes of carbonic acid represent ..... 10 of oxygen
On the other hand, we have residue ..... 38 of oxygen
Then ..... 52 of oxygen consumed
And ..... 104 hydrogen corresponding.

Total 204

From the action of chlorine and potassium, it may be concluded that it was engaged in a mixture of 90 hydrogen and 10 of carburetted hydrogen.

Thus 100 grammes of anthracite yielded 19 lit. 66 of gas at 0° and 76, that is to say, 1gr. 75 hydrogen.

ELEMENTARY ANALYSIS.		INDUSTRIAL ANALYSIS.	
Ferruginous ashes	6.90	6.90 } 89.33 coke	
Carbon	87.22	82.43 }	
Hydrogen	2.49	19*lit.* 66 of gas (not luminous)	
Nitrogen	2.31	30.87 of reduced lead	
Oxygen	1.08	Small proportion of sulphur.	
	100.00		

III. Anthracite of Vixille.

Density = 1.73

PHYSICAL PROPERTIES.—Texture foliated, fracture rough; the broken parts are very much polished, shining, and rarely variegated. It is difficult to powder it on account of its hardness; its dust does not soil the fingers. It fractures in burning, and produces no flame.

ANALYSIS OF THE FRACTIONED GASEOUS PRODUCT.

	I.	II.	III.	Total.
Gas employed	100	100	100	300
Oxygen employed	100	100	100	300
Residue after detonation and the action of potassa	49	47	50	146

	Calculated mean of partiat analyses.	Analysis of the whole mixture over water.	Analysis of the whole mixture over mercury.
Gas employed	100	100	100
Oxygen employed	100	100	100
Residue after detonation	..	..	50
Residue after potassa	48.66	49	49

1 volume of carbonic acid represents	1 of oxygen.
Adding the residue	49 of oxygen.
Then the	50 of oxygen consumed.
And	100 of hydrogen corresponding.
Total	200

These results being confirmed by the action of chlorine and of potassium on the gases, it must be admitted that the gas collected was only a mixture of 99 parts of hydrogen and 1 of carburetted hydrogen.

Thus 100gr. of anthracite gave 6 lit. 92 of gas at 0° and 76, that is to say, in weight, 0gr. 61 of hydrogen.

ELEMENTARY ANALYSIS.		INDUSTRIAL ANALYSIS.	
Ashes	1.90	1.90	88.33 coke.
Carbon	94.09	86.43	
Hydrogen	1.85	6*li.* 92 gas (not luminous)	
Nitrogen	2.85	31.8 reduced lead.	
Oxygen	0.00	Sulphur in appreciable quantity.	
	100.69		

IV. Anthracite of Isère, given by M. Regnault.

Density=1.65

Physical Property.—Foliated texture, rough fracture, the broken parts are shining and polished; combustion is difficult, without flame and without division of matter.

ANALYSIS OF THE FRACTIONED GASEOUS PRODUCT.

	I.	II.	III.	IV.	Total.
Gas employed	100	100	100	100	400
Oxygen employed	100	100	100	100	400
Residue after detonation and the action of potassa	48	48	50	60	206

	Calculated means of partial analyses.	Analysis of the total mixture over water.	Analysis of the total mixture over mercury.
Gas employed	100	100	100
Oxygen employed	100	100	100
Residue after detonation	..	..	58
Residue after potassa	51.5	52	52

Recapitulation made of 6 vol. of carbonic acid being equal to	6 of oxygen.
Residue	52 of oxygen.
Of	42 of oxygen consumed.
And of	84 hydrogen corresponding
Total	199.9

Whence it results, after testing the gas with chlorine and potassium, that a mixture of 94 parts of hydrogen and 6 of carburetted hydrogen had been analysed.

100 grammes of this anthracite furnished 16 lit. 99 of gas at 0° and 76, that is to say, in weight, 1gr. 5 of hydrogen.

ELEMENTARY ANALYSIS.		INDUSTRIAL ANALYSIS.	
Ashes	4	4	93.33 coke.
Carbon	94.0	89.33	
Hydrogen	1.49	16*li.* 99 of gas (not lighting.)	
Nitrogen	0.58	32.30 reduced lead.	
Oxygen	0.00	An appreciable quantity of sulphur.	
	100.07		

Before drawing conclusions, I may add a few words relative to the anthracite of Glamorganshire.

The quantity of gas which may be furnished by calcination in close vessels, being estimated at 240 lit., per kilogramme of combustible, it is evident that these results resemble those obtained in the large way, in gas houses, since from about 180, 200 to 250 lit., of gas may be collected from a kilogramme of pit-coal: it is true that the properties of the hydrogen are of no use; but it is certain that by means of steam directed on this combustible heated to redness, there is produced at Swansea, a gas possessed of great luminous power. The

purity of this anthracite is so great that when the operation has been properly conducted, there remains no carbonaceous matter in the retorts.

From the above, it is evident that a combustible whose mass would be presented, in all its parts of exploitation, with this homogeneity, would be a discovery of great value for the treatment of iron ores, and the quality of the products which result from them.

If, as I cannot doubt, certain very compact anthracites had been more or less suddenly cooled, after fusion, it may be conceived that the matter would have acquired a state of temper comparable to Rupert's drops, and that the least shock or the least elevation of temperature, would cause their dissemination. Indeed, this is what happens with a species of anthracite recently discovered on the left bank of the Seine, by a monk of Solem. When a blow is struck on one of the points of the most external bank of the anthracite, the neighbouring parts are reduced to dust: on account of this singular property, the workmen have given it the name of *anthracite mousseux*. It is not uncommon, on the contrary, to see anthracites with a foliated texture capable of supporting all changes of temperature, and of being used, either for the emission of gas, or for the penetration of air into their interior, during the whole of the combustion.

GENERAL TABLE OF THE ELEMENTARY COMPOSITION OF ANTHRACITES.

	Anthracite of Swansea.	Anthracite of Sable.	Anthracite of Vizelle.	Anthracite of Isere.
Carbon.....	90.58	87.22	94.09	94 00
Hydrogen	3.60	2.49	1.85	1.49
Nitrogen	0.29	2.31	2.85	0.58
Oxygen.....	3.81	1.08	0.00	0.00
Ashes.....	1.72	6.90	1.90	4.00
	100.00	100.00	100.69	100.07

A glance at the above table will show that several anthracites contain a proportion of carbon, of which the combustibles hitherto analysed have not presented any example.

In the second place, it may be remarked that all these samples heated, in close vessels, to a very high temperature, gave out a notable quantity of almost pure hydrogen.

This entirely unexpected result, if it were uniform in all anthracites, and I shall show that it is, would become a distinctive characteristic of this class of bodies.

Without the knowledge of this fact, it is very evident that the elementary analysis of anthracites ought to have led me to a confirmation of M. Regnault's experiments, and of the consequences which he has drawn from them, namely, that in descending from the modern alluvial soil to the tertiary and secondary ones, and those of transition, the combustibles belonging to these formations gain carbon, and diminish in hydrogen and oxygen. As to the production of hydrogen, I will try to explain it, allowing myself at once to be guided by the physical properties of the combustibles, their geological position, and the study which has been made of them, as well with respect to their composition, as with regard to the alteration which they undergo by distillation.

Thanks to the extreme delicacy of the analytical processes devised for the estimation of nitrogen, chemists, for the last few years, have been able to prove the presence of that element, in the organization of all vegetables; and, recapitulation being made of MM. Boussingault's and Payen's investigations, it is found that all herbaceous plants, in equal weights, contain much more nitrogen than the woods. These quantities amount on the average, in the former, to 2, 5, and 3 per cent. From some analyses made by MM. Regnault and Fikenscher, nitrogen would amount to 2.27 per cent. in turf, and to 2 per cent. in coal. Two of the anthracites which I have analysed are in this situation; often also, in most of the latter, not more than half per cent has been found.

Now, these variations, it must be admitted, are very slight, and consequently not sufficient for establishing a difference between the nature of the vegetables which have served as a basis for great formations of combustible, and that of the plants which compose the modern deposits.

I will by no means insist on the quantity of ashes left after the incineration of these carbonaceous matters, since it depends on the age of the vegetables, on the nature of the soil to which they were attached, and on the earthy substances with which they were impregnated after their death. If there were any identity in the mean composition of these debris of vegetables aggregated by time, it remains to be asked, what cause has impressed them with such different physical properties?

And at first it is known that the configur-

ation of anthracites, of pit coals, and of bituminous woods, is a very strong attestation of the degree of softening and fusion which these combustibles have undergone. The proof that these masses of combustibles must have undergone fusion, I very naturally draw from the geological classification generally admitted at the present day.

This anthracite abounds at the inferior part of the strata of transition; it composes more or less powerful beds, alternating with freestone, calcareous *jurassique*, pyrophoric rocks, and argillaceous schists. If, therefore, these rocks could be regarded as of igneous origin, it is evident that at the time of their effusion, the tertiary and intermediary soils which they passed through must have undergone great alterations.

But pit-coal commences at the superior portion of the soils of transition; it occupies especially the secondary soil, and may extend to the tertiary. Hence it follows that from the anthracite to the most distant boundaries of the pit-coal, there should exist a series of modifications, which necessarily relate to the action of decreasing temperatures.

To better illustrate my idea, I will compare the influence of igneous rocks on combustibles to the results obtained in our laboratories, by the distillation of these same bodies in close vessels. Indeed, towards the end of this decomposition, ordinarily only marsh gas mixed with hydrogen is obtained.

Now, the compact and homogeneous texture of certain anthracites denotes fusion; the nearly pure hydrogen which I collected indicates a decomposition of the same order.

At a less advanced period of the distillation, the temperature being less elevated, a portion of carbon, with the excess of hydrogen, produces liquid or solid hydrocarbons, which disperse when the apparatus is without pressure.

The same decompositions occurring in the coal pits, most frequently under the influence of a very strong pressure, one part of the combustible would be changed into dry coal, abandoning a certain quantity of hydrocarbons, which impregnate the superior layers, and remain intimately associated with them, if the temperature is sufficient for producing a commencement of fusion, and not too elevated, so as to drive the volatile matters to be lost beyond. Dry pit-coals, fat coals, and bituminous lignites, are in this situation, and give by distillation lighting gases, and tar charged with naphthaline.

As to the lignites, properly so called, and turf, which have not had to support these high temperatures, since there are still met with in them numerous traces of vegetation; they are essentially distinguished from the preceding combustibles, in yielding by distillation lighting gases and tar almost free from naphthaline, but charged, on the contrary, with acetic acid, paraffine, and eupione.

In order to give to these considerations all the character of truth, it remains for me to support them by experiments the object of which will be to isolate from the different combustibles, taken from various depths, the hydrocarbons of which I have spoken. I shall hasten to study this subject as soon as I have obtained the materials indispensable for such investigations.

ON THE COMPOSITION OF IODIDE OF NITROGEN.*

BY R. F. MARCHAND.

The author details the attempts he made to *directly* determine the composition of the iodide of nitrogen, which had not previously been done, even in M. Millon's work, in which that chemist endeavoured to show that the detonating compounds of chlorine, bromine, &c., contain hydrogen and should not be considered as binary compounds; but he admitted that he was able to arrive only at a very doubtful result, with respect to the proportion of hydrogen, by burning iodide of nitrogen with chromate of lead, the mixture having been made with the substances moistened, then dried in the combustion tube, by a current of air kept up for a long time.

M. Marchand therefore had recourse to an indirect method: he took iodide of nitrogen previously dried *in vacuo*, and he detonated it under a bell-glass: he points out the necessity of not employing too small a bell-glass, which would be broken by the violence of the shock. The experiment being dangerous, cannot be made with too many precautions. The iodide ought to be detonated several times, each time acting on about 0.05m. and at the same time covering the porcelain plate with the bell. Having collected a certain quantity of the deposit which was formed on the sides of the bell, the author examined it and found that it contained, without doubt, hydriodate of ammonia, which shows the existence of hydrogen in this compound.

The formula I^2, N^2, H^4, being besides quite as probable as I^3 N, the latter should be banished from chemical works.

Calculated in hundredths, the formulæ I^3, N^2, H^4, gives:—

I^2	1579.50	88.66
N^2	177.07	9.94
H^4	24.96	1.40
	1781.53	100.00

* *Erdmann's Journal*, vol. xix. p. 1.

It is evident how small the quantity of hydrogen is: we are not therefore surprised at the difficulty of ascertaining its proportion with certainty. The author, who is occupied with investigations conceruing the detonating compounds, announces his intention of examining fulminating platinum, because he thinks this compound very likely to throw light on this class of substances, although it differs from these fulminating azotous compounds in its mode of preparation.

The author had commenced his investigations by the examination of fulminating gold: the analysis of this substance presented much difficulty and great danger; nevertheless, he ascertained that, conformably with M. Dumas' experiments, fulminating gold contains hydrogen. As to the presence or absence of oxygen, he could say nothing.

ON SEVERAL NITROUS COMBINATIONS: ON THE PRODUCTION OF CRYSTALLISED SULPHATE OF LEAD IN THE LEADEN CHAMBERS: AND ON THE EFFLORESCENCES ON WALLS.*

BY M. F. KUHLMANN.

In May, 1839, the author made known the existence of many combinations, which he had obtained by putting the oxides and acids of nitrogen in contact with the anhydrous acids, and especially sulphuric acid and the metallic chlorides. By pursuing these investigations, he was enabled to extend the square of these remarkable compounds by forming compounds analogous to fluoride of silicon. The following is a brief abstract of what be now acquaints us with.

Sulpburic acid enters directly into combination with deutoxide of nitrogen and nitrous, byponitric and nitric acid, $N^2 O^5 + H^2 O$. M. Kuhlmann has not been able to obtain the direct combination of anhydrous nitric, with anhydrous sulphuric acid, but the affinity of anbydrous sulphuric acid for nitric acid, with one atom of water, is so great, that by placing nitric acid in a flask surrounded hy a refrigerant mixture, and directing into it the vapor of sulpburic acid, the vapors of the nitric acid are absorbed into the retort containing the sulphuric acid, and the neck of the retort is covered with white crystals.

The various anbydrous compouuds appear to give corresponding hydrated ones. The combination of $S O^3$ and $N^2 O^5 + H^2 O$, submitted to distillation, gave at first $N^2 O^4$, and much oxygen: hy pursuing this distillation, there passed over a matter which solidified and formed white crystals in the neck of the retort, and all disengagement of hyponitric acid and oxygen ceased. The liquid in the retort was of a deep yellow, and became discolored by cooling: in contact with the air, it gave rise to a violent disengagement of deutoxide of nitrogen. It was no other than sulphate of deutoxide of nitrogen. The reaction seems to be explained by the decomposition, at a high temperature, of the nitric compound into a much more stable compound of deutoxide of nitrogen; hence the disengagement of oxygen.

Fluoride of boron and fluoride of silicon, in contact with deutoxide of nitrogen, and nitrous, hyponitric and nitric acids form corresponding compounds. The fluoride of boron, in particular, has a great affinity to the nitrous compounds. None of these compounds form any combination with the protoxide of nitrogen.

Fluoride of boron and fluoride of silicon, are absorbed in large quantity by concentrated nitric acid: these solutions give out white fumes: the action of water displaces boracic acid from the solution of fluoride of boron: the action of water does not give rise to the separation of silica, by acting with the fluoride of silicon. On saturating this second solution with the alkalis, silica is not precipitated, and the dissolved fluoride of silicon appears to enter into the composition of the saline matter obtained.

The compound of fluoride of horon and deutoxide of azote, appears to be the most stable; for, on heating the compounds of nitrous acid, oxygen is disengaged.

Perchloride of tin gives, with deutoxide of azote, a crystalline product, which easily distills, and is decomposed by water. Analogous products are obtained with chloride of tin and nitrous, byponitric, and nitric acids; hut the reaction of percbloride of tin on these acids, occasions an abundant disengagement of chlorine and hyponitric acid, and after the distillation there remains oxide of tin.

The most oxygenous nitrous compounds seem to be brought by heat to the state of combination with the deutoxide of nitrogen which presents the most stability of all the compounds in question.

The second communication of M. Kuhlmann, related to the crystals of artificial sulphate of lead, which he obtained in the manufacture of sulphuric acid.

Artificial sulphate of lead has hitherto been obtained only in the state of a white powder, without any crystalline appearance, whether prepared by the action of sulpburic acid on lead or its oxide, or by the decomposition of a salt of lead, dissolved in water by means of sulphuric acid, or a soluble sulphate. M. Kuhlmann has obtained the for-

* *L'Institut*; Nos. 373-4.

mation of crystallised artificial sulphate of lead, under the following circumstances.

With the view of obtaining a more complete condensation of the sulphuric acid formed in the leaden chambers, he caused the vapors formed of a mixture of sulphuric acid, hyponitric acid and water, to be circulated, on leaving the leaden chambers, in great leaden cases. In consequence of the previous condensation of the greater part of the sulphuric acid, hyponitric acid predominates in this mixture, and ought, consequently, in presence of the vapor, to give rise to a great quantity of nitric acid. It is under the influence of these corrosive vapors that the lead of the condensing cases becomes covered, in a few days, with a very thick layer of sulphate of lead, perfectly crystallised in needles and bracteæ, of a silky appearance, analagous to the crystals of chloride of lead.

The form of these crystals is very difficult to ascertain. It appears to resemble that of the native sulphate; they have a simple refraction, prisms are observed in them, terminated by pyramids and superposed rhomboïdal tables, retreating from one another. The salt is anhydrous, and it constitutes a neutral sulphate, perfectly pure, and not retaining any nitrous element. Its specific gravity is from 6·061 to 6·086.

The formation of crystallised sulphate of lead, under the influence of the nitrous vapors from the leaden chambers, almost freed from sulphuric acid, is so prompt and so abundant, that M. K. was obliged to give up this mode of condensation, and to effect it by other means.

The practical consequence of the facts observed is, that the preservation of the leaden chambers in the manufacture of sulphuric acid, is owing to the great excess of that acid in the nitrous vapor.

M. Kuhlmann's third communication relative to the efflorescences on walls, is as follows:

M. Kuhlmann proved that as there are formed in many circumstances efflorescences of nitrate of potassa and ammonia, the same also, under other circumstances, still more frequent, may be observed on walls, owing to carbonate and sulphate of soda: walls recently constructed with mortar and stones or bricks, give rise to exudations of caustic or carbonate of potassa, charged with the chlorides of potassium and sodium. The principal source of these salts of potassa and soda exists, according to M. Kuhlmann, in the lime used in building. He shows that many lime-stones contain chlorides of potassium and sodium, and particularly alkaline silicates which may give rise, under the influence of carbonate of lime, or quick lime, resulting from the calcination of those stones, to potassa and soda, either caustic or carbonated.

The examination of the efflorescences on the walls, has led M. Kuhlmann to examine coals, in order to ascertain what saline substances are associated with them. He has proved that the coals are often penetrated with a great quantity of carbonate of lime, combined with variable proportions of carbonate of magnesia. He ascertained that besides sulphate of iron, arising from the decomposition of the pyrites, there is formed on the surface of many pit coals efflorescences, owing to almost pure sulphate of soda, but without potassa. He has also detected, in these efflorescences, the existence of a small quantity of cohalt.

ACTION OF IODINE ON CHLORATE OF POTASSA.

BY M. E. MILLON.

Gay-Lussac, in his celebrated Memoir on iodine and its combinations, remarked that chlorine did not decompose the iodates. This fact might appear surprising at the time when the remarkable analogies between iodine and chlorine were discovered, and when it was seen that chlorine might be substituted for iodine, in equivalent proportion, throughout the long series of their combinations.

On reflecting on the comparative affinity of these two bodies, and on the complex manner in which it may be exercised in compounds of such a nature as the iodates and chlorates, I hoped to arrive at a substitution the inverse of that which is generally observed between chlorine and iodine. I caused iodine to act on chlorate of potassa, and the facts have answered in a decisive manner, which I think very remarkable.

Without heat there was no very sensible action between iodine and chlorate of potassa: but if on a determinate quantity of chlorate of potassa three or four times its weight of distilled water be poured, and the temperature raised to the boiling point, iodine added to this solution disappears in considerable quantity, although the liquor remains colorless. It remains colorless so long as, in adding the iodine, the equivalent proportion be not exceeded. When it has arrived at this extent, the liquid begins perceptibly to acquire a yellow, and then a brown color, and we obtain, as a final result, neutral iodate of potassa and chloride of iodine, containing a larger or smaller proportion of iodine.

If it be evaporated to dryness, chloride of iodine is disengaged, and pure iodate of potassa remains.

By stopping the action of the iodine on the chlorine before the proportion of an

* *Comptes Rendus*; No 5, Feb. 1, 1841.

equivalent of iodine was obtained, it was found that the liquor already contained the iodate formed, and chloride of iodine, doubtless corresponding to the iodic acid, for if it was very strongly heated, chlorine was disengaged, and there remained chloride of iodine, $I\,Cl^3$, which gave a precipitate of iodine, with carbonate of potassa.

The formation of chloride of iodine explains the reaction: the iodine combines with the chlorine of the chlorate, and thus leaving the chlorate, whilst the greater affinity of the iodine for the oxygen and the more considerable cohesion of the iodate, cause the iodine to enter into the chlorate in the place of the chlorine.

The reaction may be represented thus:—
$5\,Cl\,O^5, K\,O + 6\,I = 5\,I\,O^5, K\,O + I\,Cl^5$.

This explanation seems to me to be confirmed also by the interesting modification which a few drops of acid, added to a mixture of chlorate of potassa and iodine, undergo by reaction.

My first idea was to facilitate the oxidation of the iodine by the presence of nitric acid; but I immediately perceived that a few drops of acid, added to a considerable quantity of iodine and chlorate, would be sufficient to set up a much more powerful action than that exerted between the iodine and the chlorate alone. Indeed, with this simple addition of acid, it suffices to commence the reaction by a gentle elevation of temperature, for it afterwards continues of itself; thus it proceeds until the liquor assumes a slight yellow umber tint; there is at the same time an abundant disengagement of chlorine, and by afterwards evaporating to dryness, very pure iodate of potassa is obtained.

It is evident that, in this latter reaction, the oxidation of the iodine is determined by the chloric acid set free by the nitric acid. Iodic acid is formed, which, carrying its action on a new quantity of chlorate, again eliminates chloric acid, and thus propagates the oxidation of the iodine and the elimination of the chloric acid, until all the chlorate is decomposed. What proves this curious mode of action is that the chloride of iodine, which is an essential product of the action of iodine on chlorate of potassa, is only an accidental product in the action carried on under the influence of nitric acid. The formation of this body may be almost entirely avoided by adding the iodine gradually: chloride of iodine is hardly formed, without the disengagement of chlorine is rapid. To avoid the formation chloride of iodine, the liquor must be kept boiling.

To prove the accuracy of these experiments I weighed 10 grammes of well-dried chlorate of potassa, which I treated by a sufficient quantity of iodine, under the influence of a few drops of nitric acid: I evaporated it to dryness. The dried and perfectly white product gave 17.3gr. of iodate of potassa. Theory indicates 17.4 gr.

To ascertain the purity of the iodate thus obtained, I decomposed by heat 1.805 of it: I obtained 1.389 gr. of iodide of potassium. Theory gives 1.399 gr.

Sulphuric and iodic acids answer as well as nitric acid for commencing the action.

This process certainly is the most simple and most expeditious for preparing iodate of potassa, which it yields perfectly pure. It is evident that the preparation of iodide of potassium might be thus arrived at; but before it can be economically used, the high price of chlorate of potassa, which is daily lowering, must yet be considerably reduced.

As to the reaction caused by the action of a few traces of acid, it reminds us, in mineral chemistry, of the curious phenomena of transformation by influence, which are frequently met with in organic chemistry. But—which has not always been the case in organised chemistry—the means by which the transformation is here operated, is followed up and may be readily understood.

ON THE ACTION OF METALLIC TIN ON SOLUTIONS OF MURIATE OF TIN.*

BY AUGUSTUS A. HAYES.

It has been long known to those who frequently dissolve tin in muriatic acid, that under some circumstances, the metal after it has been dissolved is precipitated. It sometimes presents large sections of octahedral crystals; at others, long prismatic needles, which are so arranged as to form skeletons of such sections. In this Journal, vol. xxvii, p. 255, Mr. W. W. Mather has described some experiments having a similar result. The interest which has been excited of late by notices of the non-action of metals in acid solutions and in relation to chemical action of a similar kind, has induced me to publish the facts which I sometime since observed.

When tin is dissolved in muriatic acid, either by gradual action under exposure to air, or by the aid of heat, a solution containing an excess of acid is obtained. This solution may be concentrated to a sp. gr. = 1·750, and retains its fluid form at or above 60° F. Although an excess of tin is present, the solution thus obtained is always acid. After decanting the clear solution, the tin used in excess with its impurities remains. Generally, after a few days' exposure, the matters left in the solution ves-

* *Silliman's Journal.*

sel change in appearance. The dull, corroded fragments of metal become frosted over, with bright needles of tin, and beautiful arborescent forms are seen. On studying the circumstances, I have found that the effect is due to electrical action. One portion of the undissolved tin, becoming a *positive* electrode, while another portion of the same mass assumes the state of a *negative* electrode, and precipitation of the dissolved tin takes place on it. Numerous cases of like action are known to chemists, where a part of a bar becomes indifferent to a concentrated solution, although a positive state is exhibited at another part, and active solution of the metal is taking place.

For the purposes of experiment, a solution of muriate of tin, of sp. gr. about 1·650, contained in a cylindrical vessel, may be carefully covered by half its volume of an acid solution of the same, having a sp. gr. about 1·20. The two fluids should not be mixed more than the slight diffusion which will take place. After placing a flat bar or plate in an inclined position, so that it passes through both solutions, the effects become immediately perceptible. That part of the bar which is within the diluted solution takes the *positive* state. A few minute bubbles of hydrogen form and escape, if the solution is quite acid. Precipitation of metallic tin commences near the line of contact of the two solutions, and extends throughout that part of the bar immersed in the denser solution. If the diluted solution is not rendered acid by the addition of acid, hydrogen is not perceived, and the action is more gradual. In either case the precipitation continues until the two fluids have attained the same electrical relation to the bar. If after the precipitation has ceased, water be carefully poured upon the surface of the fluid, it will form a stratum of very dilute solution. That part of the bar not before immersed takes the negative relation to this solution, and the same kind of precipitation follows as had taken place in the lower solution. The positive part of the bar, retains its state unaltered under the new conditions, and the line of separation is as clearly defined as in the first case. If a solution mixed with crystals be used, instead of a moderately concentrated solution, they are not decomposed under the above conditions. The presence of atmospheric oxygen has been supposed to influence this action. Such is not a correct statement; by exposure to atmospheric vapor, strong solutions of muriate of tin become weaker, and any masses of undissolved tin, projecting into the weaker solution, will decompose the denser solution below. In numerous trials, I have found all the cases of precipitation referable to different states of two solutions resting in contact.

REVIEWS.

Agricultural Chemistry. By the Rev. C. A. Lloyd. *Written and published at the request of the Members of the Shropshire Natural History Society, and delivered before them on the 3d of April,* 1840. Shrewsbury: G. Matthews, High Street, 1840.

A very able and instructive little pamphlet by a clergyman, who, not content with attention to the spiritual welfare of his flock, teaches them by what means to improve the benefits bestowed on them by the Almighty. In directing the attention of the agricultural population of his neighbourhood to the study of that branch of chemistry which is so intimately connected with their pursuits, Mr. Lloyd has conferred on them an everlasting benefit. We hope that his example will be followed by all clergymen in farming districts, to each of whom we would say—go thou and do likewise.

His remarks relative to the size of farms, are very worthy of attention, and we should be happy to transcribe them, did our space permit; as it is, we are forced to content ourselves with giving the following extract, as an example of the manner in which the author treats his subject:—

"Having briefly stated the condition of society which I think most favorable, and most unfavorable to a healthy state of agriculture, I shall now proceed to point out how I conceive our land may be made to bring forth an immense quantity of produce more than it does at present. The first question to be ascertained is, of what do the most fertile soils consist? and the next is, if it be possible to make other soils, which are less fertile, as productive as those which are so by nature?

"If I had a barren sand, like Bagshot heath, and which is of little value, how am I to proceed to improve it? To answer these questions I will state, that if any land is unproductive, the reason is, it is in want of one or two of the earths of which all the best soils are composed, namely, limestone, sand and clay. None of these earths by themselves will produce luxuriant vegetation, but when the three are *intimately* united together in the following proportions, namely, sand three-fifths, lime one-fifth, and clay one-fifth, then the mixture will produce good wheat and oats without any manure whatever, as I have seen by experiment. If this mixture was submitted to chemical analysis, it would be found to contain a much larger portion of silica than three-fifths, because common limestone and clay usually contain much silicious matter. The very stiffest clays do not contain more than 36 per cent. of alumina. If any person wishes to make the loam I have described

on a small scale, let him mix the three earths in the proportion mentioned. In order to do this, the clay should be tempered as for brick-making, and when quite soft, the lime and sand may be added, with as much water as to saturate it completely. In this state it should remain some hours, when the whole may be beaten as if it was mortar for building walls. It should then be left until the lime be carbonised from the atmosphere. When this has taken place it may be known by treating a small portion of the new made loam with muriatic acid. When it effervesces freely, then you may add manure, peat, or any animal or vegetable matter, as weeds, clippings of hedges, rubbish from hedge banks, and when these things are rotten, the soil will be fit for use, if the whole is sufficiently blended. The next step is to remove the soil from a certain portion of your garden to the depth of two or three feet, and to fill up the hole with the composition. Wheat, oats, mangel worzel, potatoes, and turnips, I have found to flourish in this soil; but some plants, as peas and beans, require soil of a greater age. As the three mentioned earths are all necessary to assist in forming soil, which will produce luxuriant vegetation, the Almighty Disposer of all things has given a great abundance of them to mankind. I shall speak of each of them. The whole three, when pure, appear white, resembling whiting. Pure clay is called by the chemists alumina, and was proved by Sir H. Davy, to be an oxide of a metal now named aluminum. Alumina is one of the most abundant productions of nature; it is found in every part of the world; in rocks, mountains, and alluvial depositions. The clay of which bricks and earthenware are made, is in a greater or less degree of purity. The more clay contracts in baking, the greater quantity of alumina it contains. Alumina is sometimes found crystallised, as the ruby and sapphire, two of the most beautiful of precious stones. Pure alumina is prepared from alum, by mixing the alum with potash in hot water, and after a few minutes the alumina is collected on a filter, and washed with hot water.

"Alumina has neither taste nor smell, and is insoluble in water, and does not enter into the composition of either animal or vegetable bodies. It is of great use in soils to give them consistence, without which trees and plants would be blown down by the wind; it also makes the ground more retentive of moisture and manure.

"Pure sand is called silica, or oxide of silicon, a substance analogous to carbon and boron. Silica exists in great abundance in quartz, sandstones, and rock crystal, and in the common sorts of lime-stone. It is a large ingredient of very many minerals, including the hardest gems and the softest clays. It enters into the composition of about two-thirds of the whole number of minerals whose nature is known.

"No one is ignorant to what an extent it is found on the sea-shore, and that God has placed it as a barrier against the raging of the impetuous ocean. It is esteemed by some to be the most abundant substance in nature, and it ought to be the most abundant substance in all soils which deserve to be called fertile.

"Silicious earth, of sufficient purity for most purposes, may be obtained by heating transparent specimens of rock-crystal, and then reducing them to powder. Pure silica, in this state, is a light white powder and is without taste or smell, and melts with difficulty. It fuses with potash and soda and forms glass.

"Lime is an oxide of a metal called calcium, discovered by Sir H. Davy. Lime commonly exists in nature united with carbonic acid, and in this state it forms lime-rocks and all the various kinds of marble. Carbonate of lime exists in the greatest purity in Iceland spar and Carara marble. When lime-stone is heated red hot, the acid is driven into the air, and what is commonly called quicklime remains. It melts with great difficulty.

"It has a strong affinity for water, with which it unites with a great heat, forming what is called slacked lime, or hydrate of lime. Hydrate of lime dissolves sparingly in water, but it is a curious fact that water of 32 Fahrenheit, is capable of dissolving twice as much of it as when the water is at the boiling points. Carbonate of lime exists in great profusion in nature, in lime rocks, in chalk beds, and in marl, which latter is a natural mixture of carbonate of lime and clay.

"The greatest ignorance of the nature of limestone existed until the year 1755, when the celebrated Doctor Black, proved that it consisted of an earth and an aërial acid, now called carbonate acid. Carbonic of lime is a necessary ingredient in all fertile soils. Quick-lime acts as a stimulus on the animal and vegetable matter in soils. Dr. Tenant, the Professor of Chemistry at Cambridge, discovered that some lime-stones contain magnesia, and that calcined magnesia is injurious to vegetation, but this was not the case when the earth was in the state of carbonate. In some places the turnpike-roads are mended with lime-stones; when this is the case, the road scrapings must be very valuable either on clay or sandy soils which may be deficient in calcareous matter.

"Now all these three earths, however useful they are when intimately united together in proper proportions, are quite use-

less, as to vegetation, when by themselves, and no soil is productive that contains nineteen parts out of twenty of any of the three earths mentioned. If persons are desirous of improving their lands permanently, this is only to be done by carrying that earth into their fields in which their lands are most deficient by nature. Thus, if land be a stiff clay, it will be improved permanently by carrying sand, peat, and lime, or coal-ashes to it; or, on the other hand, if it be sand, then clay, marl, or lime may be added, as most convenient. It is quite a common practice in Norfolk, for farmers to carry subsoils upon their lands, and this is done to a very great extent at the expense of sixpence per cubic yard, or thirty shillings for a hundred cubic yards. Sir H. Davy, in his book on Agricultural Chemistry, has given an analysis of several rich soils from various parts of the kingdom; and in all cases, each of the three mentioned have formed considerable portions of the soil."

In conclusion, the limited space which can be afforded to a review, does not admit of our giving any very accurate idea of such a work as that before us: we therefore recommend our readers to procure it and judge for themselves.

Instructions for the Discrimination of Minerals by Simple Chemical Experiments. By Franz Von Kobell, Professor of Mineralogy in the University of Munich. Translated from the German, by Robert Corbet Campbell.—Glasgow: Richard Griffin and Co., and Thomas Tegg, London, 1841. Griffin's Miscellany, No. V.

This work, from its comprehensiveness, as well as from its very condensed form, is eminently worthy of the attention of the mineralogist, whether he be a mere beginner or an adept in that beautiful science.

We look upon it as a very valuable and useful addition to mineralogical literature, and we advise our readers speedily to possess themselves of it, and to give it an attentive perusal.

To the practical mineralogist, it will be found of great utility as a book of every-day reference.

The author divides minerals into two classes—minerals with metallic lustre, and with non-metallic lustre. Those which have an imperfect metallic lustre, belong to the first class, when quite opaque; and to the second "when translucent on the edges." He divides each class into three orders, as follows:—

CLASS I.—MINERALS WITH METALLIC LUSTRE.

O. Metals easily distinguishable by their physical properties.

A. Fusible, 1—5, or else readily volatile.

B. Infusible, or fusibility above 5, and non-volatile.

CLASS II.—MINERALS WITH NON-METALLIC LUSTRE.

A. *BB, easily volatile or combustible.

B. BB, fusible, 1—5, but not, or only partially, volatile.

C. BB, infusible, or fusibility exceeding 5.

Each of these orders is again sub-divided; but space will not admit of our going farther into the details of the classification: we therefore select the following as a specimen.

NATIVE METALS EASILY DISTINGUISHED BY THEIR PHYSICAL PROPERTIES.

Native Mercury, Hg. Gediegen Queck-silber.

Liquid at common temperatures; of a tin white color.

Native Silver, Ag. Gediegen Silber.

Silver-white, perfectly malleable, easily soluble in nitric acid; the solution treated with muriatic acid gives a curdy white precipitate, which rapidly changes color when exposed to the light, becoming first grey, and then black. H. 2,5.

Native Gold. Au. Gediegen Gold.

Argentiferous gold.—Ag+Au. Electrum. Goldsilber. Possess more or less golden yellow color, and are perfectly malleable. *Native gold* dissolves only in aqua regia. (Nitric and muriatic acids mixed together,) and leaves scarcely any residue. *Argentiferous gold* is wholly or partially decomposed by aqua regia, under separation of chloride of silver. The solutions of both give, with protosulphate of iron, a reddish brown precipitate of gold, to which friction communicates a metallic lustre, and the yellow color of gold.

Native Copper, Cu. Gediegen Kupfer.

Of copper-red color, ductile and malleable; soluble in nitric acid, giving an azure blue solution.

Native Lead, Pb. Gediegen Blei.

Of lead-grey color, ductile and malleable; BB, easily fusible; smokes and deposits on the charcoal a greenish yellow sublimate, soluble in diluted nitric acid; the solution affords, with sulphuric acid, an abundant white precipitate. H. 1, 5.

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* BB. signifies *Before the Blowpipe.*

Native Platinam, Pt. Gediegen Platin.
Palladium, ...Pd.

Both ductile and malleable; both infusible. Platinum is of a steel grey colour, not soluble in nitric acid, but dissolves when digested in aqua regia. Palladium possesses a color between steel-grey and silver-white, is dissolved hy nitric acid, but more easily by aqua regia. The solution of platinum gives, with carbonate of potash, a yellow precipitate, insoluble in excess; that of palladium gives with carbonate of potash a brownish precipitate soluble in excess.

Native Iron, Fe. Gediegen Eisem.

Ductile and malleable; light steel grey; attracted by the magnet; infusible; easily soluble in muriatic acid.

A. FUSIBLE, 1—5, OR EASILY VOLATILISED.

A. 1. BB. *in charcoal, produce a strong odour of arsenic.*

Native Arsenic.=As. Gediegen Arsenik.
Arsenic Glance.=As. Arsenikglanz.

BB, volatilise without fusing; sublime in a bulh tube as a metallic greyish-white crystalline crust. *Arsenic Glance*, BB, takes fire, and continues to burn with a continuance of the blast; gives a grey arsenical smoke, and becomes covered with crystals of arsenious acid. *Native Arsenic* ceases to buru on being taken from the blowpipe flame.

Arsenical Grey Copper =Fe Zn Cu Sh As S_x, Arsenik fahlerz.
Palybasite =Cu Ag Sb As S_x

BB. on charcoal, fused and then moistened with muriatic acid, they communicated to the flame a heautiful blue colour. *Polybasite* gives, with soda and borax, a button of silver, which, by fusion with borax, may be procured quite free from copper. *Grey Copper*, treated in this way, gives with difficulty a hutton of copper only. The copper is more easily extracted by fusing the mineral with lead and boracic acid. The partial solution of grey copper in nitric acid gives, with muriatic acid, little or no precipitate; the solution of Polyhasite gives an abundant precipitate of chloride of silver. Both the minerals yield sulphuret of arsenic, and sulphuret of antimony, to a solution of caustic potash; and, on the addition of muriatic acid to the solution, these substances are precipitated in lemon-yellow flocks. (When the sulphuret of antimony is in excess, the flocks are yellowish red.) *Grey Copper* has a steel-grey color. *Polybasite*, an iron-hlack color. The hardness of the first is 3.5, that last 2.5.

Tin-white Cobalt =Co As_2. Speisskohalt.
Bright white Cobalt=Co. As_2 + Co S_2. Glanzkobalt.

BB. communicate to borax a beautiful sapphire-blue color, although present in a very minute quantity; they are dissolved hy concentrated nitric acid, under separation of arsenious acid. The solution generally possesses a rose-red colour. Silicate of potash, added to a much diluted solution, gives it a sky-blue color, or produces a blue precipitate. Chloride of barium produces in the solution of *Bright White Cobalt*, an abundant white precipitate; in that of *Tin White Cobalt* no precipitate, or only a very slight one. The color of *Tin White Cobalt* is from tin-white to light-steel grey; that of *Bright White Cobalt* is reddish silver-white.

Compare with the following substances:—

Red Arsenical Nickel = Ni As. Rothnickelkies.
White Arsenical Nickel=Ni. $As._2$ Weissnickelkies.
Nickel Glance = Ni S_2 + Ni $As._2$ Nickelarsenikglanz.

Give with nitric acid an apple-green solution. By adding to this a solution of chloride of lime till a precipitate begins to be formed, and then caustic ammonia in excess, a sapphire-hlue solution is obtained. Caustic potash and silicate of potash produce in the nitric acid solution greenish precipitates. Chloride of harium produces an abundant precipitate in the solution of *Nickel Glance*, hut none in the solution of the two other minerals.

All those substances commonly afford indications of cobalt before the blowpipe. The color of *Red Arsenical Nickel* is light copper; that of *White Arsenical Nickel* is tin white; that of *Nickel Glance* light lead grey, approaching to tin white.

See Sulpho-Antimonite of Neckel, under A 4.

Arsenical Iron = Fe S_2 + Te $As._2$ Arsenikkies.

BB. in a bulb tube, gives a sublimate of metallic arsenic, and then fuses to a black red, which, after a long continuance of the blast, becomes magnetic.* It is soluble in nitric, under separation of sulphur and arseuious acid. The solution gives with caustic ammonia, and potash, a reddish-yellow precipitate. The mineral communicates to borax the green color which indicates the oxide of iron. The fresh fracture is silver white, somewhat inclining to grey, sp. gr. 6.

See Native Bismuth, A 6, which often contains Arsenic.

A 2. BB. *charcoal, or an open glass tube, exhale the strong odour of horse radish, which distinguishes Selenium.*

* *Axotomous Arsenial Iron* = Fe $As.^2$. Mispickel acts in like manner, but after the arsenic is driveu off, it fuses with difficulty, and only imperfectly on the surface. Sp. gr. 7.2.

Seleniuret of Mercury = H_9 Se_x. Selenquecksilber.

Seleniuret of Mercurcy and Lead = 3 Pb Se + H_9 Selenquecksilberblei.

When heated with soda in tbe bulb tube, tbey give metallic mercury. The double seleniuret, heated with soda and charcoal, gives grains of lead; *Seleniuret of Mercury* gives none. Both vaporise readily; *Seleniuret of Mercury* after fusion; the double *Seleniuret* witbout fusion. The color of the first is between steel-grey and dark-lead grey; that of the last is lead-grey.

Seleniuret of Lead = Pb Se. Selenblei.

BB. volatilises almost entirely witbout fusing, and coats the cbarcoal at first with a slight metallic grey, and, afterwards with a white and greenisb-yellow sublimate. With soda it gives grains of lead, but not witbout difficulty. The solution in nitric acid gives a white precipitate with sulphuric acid. Color, lead-grey.

Seleniuret of Silver = Ag Se. Selensilber.

BB. fusion easy; quiet in the outer flame, but with intumescence in the inner; gives, with borax, a button of pure silver; dissolves in concentrated nitric acid. Tbe solution, treated witb muriatic acid, gives an abundant white precipitate of chloride of silver. Color iron-black.

Seleniuret of Copper = Cu_2 Se. Selenkupfer.

Seleniuret of Lead and Copper = Pb Se + Cu Se. Selenbleikupfer.

Eukairite = Cu_2 Se + Ag Se. Selenkupfersilber.

All fuse on charcoal to a metallic button, which, moistened with muriatic acid, tinges the flame of a beautiful color. They dissolve in concentrated nitric acid; the solution treated with ammonia in excess acquires an azure-blue color. The solution of *Eukairite* gives, witb muriatic acid, a copious precipitate of cbloride of silver; that of tbe *Seleniuret of Lead and Copper* gives, witb sulpburic acid, a wbite precipitate of sulpbate of lead; that of the *Seleniuret of Copper* gives no precipitate witb these two acids. The color of *Seleniuret of Copper* is silver-white; that of *Eukairete*, and that of the *Seleniuret of Lead and Copper* is lead-grey.

We may conclude by recommending this work to all who are desirous of becoming acquainted witb the characteristics of minerals, the instructions given for their discrimination being very complete.

MR. MORTON'S GALVANO-ARSENICAL APPARATUS.

To the Editors of the Chemist.

Gentlemen,

In your March number I perceive you have done mé tbe honor to nsert a notice of a Galvano-Arsenical Apparatus* of mine, copied from the *Inventors' Advocate*, where, unfortunately, tbe name of Martin is introduced for that of Morton.

Since it was shewn at the Royal Institution, I have been induced to simplify it, by employing one tube only, wbicb, being increased in size, I am enabled to collect a larger quantity of gas; for, when organic fluids are being decomposed by it, I find that much froth is formed, which, rising into the jet, interferes with the combustion of tbe gas. By rest, bowever, tbis fails.

The only objection to tbis alteration is, that the analyst must be careful to connect the gas receiver with tbe negative electrode of the battery, or the arseniuretted hydrogen evolved will escape.

I am, respectfully yours,
W. J. T. Morton.

Royal Veterinary College,
March 23, 1841.

NEW COMPOUND FORMED WITH IODINE.

To the Editors of The Chemist.

Into a flask having its neck lengthened with a glass tube to prevent tbe escape of iodine vapour, I put one ounce of iodine, and gradually poured two ounces and a half of oil of turpentine. A violent action instantly took place, with intense beat; as soon as the mixture bad become cool, it was put into a glass retort, with a receiver kept very cold. The heat of a lamp being applied, and keeping the mixture under tbe boiling point, an exceedingly dense fluid came over, having a suffocating vapor. Tbe distillation was carried on until the vapor assumed an oily appearance. Tbe lamp being tben removed, a few ounces of distilled water was put into the receiver, which took up a deep red color, containing a portion of uncombined iodine and a powerful acid; this being separated from the insoluble part and filtered, was put into a retort; a gentle heat being applied for a short time, a few small sbining crystals of a copper color† floated in the solution wbich deposited on cooling.

These crystals being collected on a filter, the solution was again put into a retort until one half was distilled over, and finding tbat no crystallization took place, I thought it necessary to separate the free iodine with starch. Tbis being done, tbe distillation was carried on in a water bath till nitric acid precipitated iodine from the fluid distilled

* See The Chemist, No. XV., p. 76.

† I have since obtained these crystals of a yellow color.

over, but no more crystals were deposited although frequently allowed to cool.

The acid thus obtained in the retort being highly concentrated, had suffered a little decomposition, and consequently contained a portion of free iodine. When the acid was diluted with water, a small quantity of a chrome yellow powder was precipitated. The liquid acid unites with the alkaline carbonates with effervescence.

The crystals obtained in the first part of the process were insoluble in cold, but soluble in hot water, and the solution reddened litmus paper. In the first retort a resinous mass, resembling the extract of copaiba was left, which being distilled to dryness in a sand bath, gave at first a liquid resin like the balsam of copaiba, but at the latter part of the distillation, a soft resin, and the product in the retort a carbonaceous mass, mingled with a little resin, incapable of being distilled. The resin and balsam thus obtained were soluble in ether and turpentine, but not possessing the smell of the latter.

I took six drops of the balsam in a little water, which acted as a decided diuretic.

I am, Gentlemen,

Your obedient servant,

HENRY OSBORN.

EXPERIMENTS ON THE CARBONATE OF SILVER.

To the Editors of The Chemist.

GENTLEMEN,

The following experiments on the carbonate of silver, were performed with a view of ascertaining what changes take place by exposing this carbonate to solar light, and as they appear to illustrate the matter, perhaps an account of them may not be uninteresting to the readers of "THE CHEMIST."

A quantity of carbonate of silver was suffered to remain for many weeks in such a situation that the light of the sun might act on it, during which time it was frequently stirred: it became of a black hue throughout.

A portion of this blackened carbonate of silver was placed in a glass, and an excess of acetic acid poured on it, a brisk effervescence ensued; when the whole of the carbonate was dissolved, there still remained a black powder, which being washed, was found to be unalterable in either sulphuric or muriatic acids, but was attacked with violence and dissolved by the nitric acid, from which nitric solution, muriatic acid precipitated chloride of silver.

As I happened to discover that the carbonate of silver is very soluble in either liquid ammonia, or a solution of the carbonate of ammonia, the experiment was varied, by adding liquid ammonia to the blackened carbonate instead of acetic acid; the result perfectly agreed with what has been before stated.

This black powder, by being heated, put on the appearance of metallic silver, and the same black powder was produced by leaving a plate of zinc, immersed in moist carbonate of silver.

Now, from these experiments, I think that it may be fairly concluded, that solar light reduces carbonate of silver to the metallic state. I am, Gentlemen,

Your obedient servant,

REUBEN PHILLIPS.

ON DECOMPOSITION BY HEAT.

To the Editors of The Chemist.

GENTLEMEN,

The generality of substances, susceptible of decomposition by heat, undergo no change of constitution unless the temperature be raised to a certain point, when it begins, and is completely finished, without any farther increase of temperature.

There is, however, a class of bodies, which appear to be decomposed in an irregular, and uncertain manner: for example, if the moist hydrate of alumina be dried in a steam heat it will retain an equivalent of water; if the heat be increased, some of this water will separate; but it requires a very intense heat to drive off the whole of it. Instances of this nature are not rare: we obtain precisely the same results with hydrated peroxide of iron: if this body be heated in a glass tube, over an argand flame, much of the water will condense in the tube, but it takes a red heat to deprive the oxide of the whole of its water.

The same effects are produced by heat on crystallized boracic acid and borate of soda; and, no doubt, are common to a great variety of substances.

If carburetted hydrogen be exposed to a gradually increasing heat, it will deposit successive portions of carbon; but no degree of heat to which we can expose it, will effect its entire decomposition.

We obtain these remarkable phenomena only when one of the combined bodies is strongly disposed to assume the gaseous state, and when the other is comparatively fixed.

These decompositions cannot be owing to the mutual repulsion of the two bodies, for then the substance ought to be entirely resolved into its components. Since, therefore, it cannot be owing to a reciprocal action, the effect must be ascribed to the particles of the most volatile body repelling each other out of the sphere of the mutual attraction subsisting between them and the

denser body. For example, take the hydrate of alumina: here, we may suppose the atoms of water to be approximated so closely together, that a slight increase of heat causes them to repel one another; if the heat be not sufficiently strong, the disposition of the water to become gaseous, is counterbalanced by the attraction subsisting between it and the alumina; but when the heat is so far increased that the repulsion between the atoms of water is greater than the mutual attraction of the water and the alumina, part of the water flies off, and continues to do so, until the atoms of water stand so far apart, that the repulsive energy is overpowered by the attraction between the water and the alumina. Supposing, for instance that one half of the water has been dissipated, there is no necessity for imagining that the half equivalent of water unites with the equivalent of alumina: the combination may still be an equivalent of water, to its equivalent of alumina; except that now the atoms of water are so far separated that the mutual attraction preponderates.

A complete decomposition by heat can never be accomplished unless the components of the body mutually repel each other, which can generally be effected by a due increase of caloric.

I am, Gentlemen,
Your obedient servant,
JOHN VIPER.

II. CHEMICAL MANUFACTURES.

NEW INVESTIGATIONS CONCERNING THE PRESERVATION OF WOOD.*

BY DR. A. BOUCHIERE.

THE kindness with which the Academy looked upon the work on the preservation of wood,† which I lately had the honor of submitting to it, encourages me to present to it some new studies on the same subject, which appear to me worthy of attention, as well on account of the practical applications which flow from them, as for the new experimental ways which they present to the progress of vegetable physiology.

This new work was undertaken more than a year ago, in order to resolve a serious difficulty presented by the application of the process of the penetration of wood by vital aspiration. The process, indeed, can be executed only in the sap season, and, besides that this is limited to a few months in the year, the cutting of wood at this period is contrary to established practice, and leaves in many minds the conviction —doubtless an ill-founded one—that wood must be very alterable when not cut down in winter.

To overcome these obstacles to the admission of my processes on the large scale, I applied myself to finding out a means of economically penetrating wood in winter, and, as fortunate in the second work as in the former one, I have discovered a mode of penetration different from that of vital aspiration, as economical and complete, by means of which, *I can, in the depth of winter, and in a very short space of time, penetrate all rough or squared wood.*

This process which M. Biot might have been led, by his experiments, to discover before me, if he were occupied with the same question, applies only to wood newly cut down and divided into pieces of all lengths, according to necessity. To impregnate these pieces with different liquors, it is sufficient to place them in a vertical position, and to adapt to their upper extremity, bags of impermeable linen acting as a reservoir, into which the saline solutions, or others chosen in order to give the wood new qualities, are from time to time poured. In most cases, the liquid promptly penetrates by the superior extremity, and almost immediately the sap flows. With some woods which contain a great quantity of gas, this flowing does not commence until the gases are expelled, and then the sap falls without interruption. The operation is terminated when, at the inferior extremity of these pieces of wood, liquors identical with these poured in at the top can be obtained.

In the course of the experiments which I have made with this mode of penetration, I have observed many very curious facts, which have furnished me with the materials for a more extensive work with which I am occupied; I will now confine myself to mentioning those which appear to me the most interesting.

I. It is interesting to extract the sap of almost all woods by thousands of litres; this operation is executed without expense and in a very short time; *in one single day, I have been able to collect* 4850 *litres. I operated on seven trees, and was assisted by two men.*

II. Not only can the saccharine and mucilaginous matters, &c., held in solution by the sap, be extracted, but it is also possible to procure from it the colored resinous juices, &c., which it contains; to

* *Comptes Rendus*, No. 7, 15th Feb. 1841.

† For which, see THE CHEMIST, No. VII. p. 205.

obtain this result, it is sufficient to previously impregnate the trees with liquids having the power of dissolving those juices. After a maceration of some time, if I may so speak, the artificial sap which is expelled is found charged with those matters. In one case as in the other, these juices may be turned to great advantage.

III. Thus it is discovered, I think, but without acting on masses as I have been able to do, that the sap of the periphery of wood, and that of the central parts present some differences. The more or less elevated points of the stem from which it is collected, the age of the vegetables and the period of the year at which the operation is performed, also exert their influence on the composition presented.

IV. In most cases the sap contains only some thousandths of solid matter, although the wood contains several hundredths of soluble matter. This fact points out investigations which may be highly interesting to vegetable physiology: nothing better demonstrates the vascularity of the ligneous system.

V. Woods contain different proportions of gas whose composition varies according to species, age, and the seasons. I have ascertained that in some cases these gases represent the twentieth of the cube of wood.

VI. In the course of my experiments, I have been very well able to appreciate that the contractility of the vessels of wood under the influence of certain agents, was not the same, and that whilst such a species would be perfectly penetrated by the neutral liquor A., and by the astringent liquor B., another species would admit only the liquor A. This observation is of great practical importance.

VII. The lightest woods are not those which are most easily penetrated, as one would be inclined to think. The poplar resists more than the beach or the yoke-elm, and the willow more than the pear-tree, the maple and the plane.

ON THE DECOMPOSITION OF OILS IN CLOSE VESSELS.*

BY M. BLONDEAU DE CAROLLES.

When oils, whether mineral or vegetable, are decomposed in close vessels, an abundant deposit of black matter is observed, which has been taken for finely divided carbon arising from the decomposition of carburetted hydrogen or volatile carburets under the influence of a high temperature. This phenomenon is not observed in the composition of M. Selligue's gas (see *The Chemist*, Nos. 7 and 8), which is composed, as is known, of the mixture of gases arising from the simultaneous decomposition of water and schists.

A few experiments have enabled me to account for this fact, which, previously, was not satisfactorily explained.

When bicarburetted hydrogen, or a volatile carburet, such as oil of naphtha, is passed into an iron tube, the temperature of which is nearly white heat, there is formed in its interior, a black deposit, which is not carbon, but a *carburet of iron.*

When a volatile oil and steam are simultaneously passed into this tube, there is a production of gas, arising at once from the decomposition of both the oil and the water, but there is no carbonaceous deposit.

The explanation of these facts is simple: iron, at the heat at which the operation is effected, can decompose the hydro-carbons and water; but having a greater affinity for the oxygen than for the carbon, both of which are in contact with it, it in preference combines with the oxygen, and exerts no action on the hydrocarbon.

According to that, it is evident that in M. Selligue's process, all the oil used is converted into carburetted hydrogen; which, not having lost any carbon, ought to possess a greater luminous property than that obtained by decomposing schist, without the presence of water.

The deposit of *carburet of iron*, which is obtained when oil of resin is employed, is so abundant, that the coke over which the decomposition is operated is obliged to be renewed every twelve hours, and if it be wished to collect it, it may be sold in great quantities in commerce, as lamp black.

I have several times analysed this carburet of iron, and I found that it was formed of 90·17 carbon and 9·83 iron. This is the composition assigned to *plombagine*, which since has been regarded as pure carbon.

The following are the inferences which I draw from the facts mentioned in this note:—

I. *Plombagine* really exists, but not in the circumstances which have been admitted; it is produced with great facility when red-hot iron is put in contact with carburetted hydrogen, or a volatile carburet, and it is formed in great abundance in the manufacture of gas from resin.

II. The production of this substance may be prevented by decomposing the oil and steam simultaneously.

The latter observation may become of practical utility, for we can, by driving into the distillatory apparatus a small quantity of steam, prevent the formation of plombagine, thus saving the interior of the vessels from deterioration, preventing stoppages, and preserving to the gas all the carbon which ought to enter into its composition, and which is useful to its luminous power.

* *Comptes Rendus, No.* 7; *15th Feb.* 1841.

ON A NEW EMPLOYMENT OF THE GALVANIC PRECIPITATION OF COPPER FOR MULTIPLYING PICTURES MADE AFTER THE MANNER OF INDIAN-INK.*

BY HERR FRANZ VON KOBELL.

The galvanic precipitation of copper, which, by the experiments of M. Jacobi, has already given such interesting and extraordinary results to the arts, has led the author to make some experiments of a new kind, with the view of depositing on a monochromatic drawing, a plate of copper, in order afterwards to employ it for impression. It may be foreseen that, if the surface of the picture could he made to conduct, there certainly would he formed a solid deposit of copper; but the kind of painting which always requires a fatty substance does not give a conducting color, and the method indicated by M. Jacobi, of rubbing over the surface with a lead pencil, with graphite, or any other similar conducting substance, cannot here be employed without spoiling the soft and light shades of the images.

Herr Von Kobell, therefore, sought to cover with copper, without this means, an image painted on silver. He immediately understood that time alone was required for the non-conducting parts, intermixed with, and surrounded hy others which were good ones, to be covered also. The experiment answered, and drawings made with wax, varnish, chemical ink, &c., were often covered in a very short time, without having been made conductors. It might often be observed how, in the midst of a non-conducting surface which covers the whole of the plate, small globules of copper were very soon formed, and how, by the aggregation of a few fillets, these globules gradually united. As it always requires about four or five days before a plate sufficiently thick for impression can be obtained, it is so much the less necessary to render the color a conductor, for the fine shades or the lighter parts are not ordinarily quite covered until the second day, and there remains only a few free places which may then, to hasten the final operation, be covered with a good lead pencil, which may be done without injuring the drawing. Before doing this, the plate must be dried with filtering paper.

As to the manner of executing the picture which it is wished afterwards to copy, it is necessary that it should he made on a polished plate of silver or copper.† The picture is monochromatic, and is made with the thick oil used by painters on porcelain, and which remains as a residue after the evaporation of turpentine. It is mixed with iron rust, and used as in painting on porcelain. A good color, which dries quickly, may also he obtained by means of a solution of Dammara wax in turpentine, to which is added iron rust, mineral black, or something similar.

It is evident that in this monochromatic picture the diversity of the tints is produced only by the different thicknesses of the color applied to the plate of silver, so that the lights are given by the metallic surface, and the demi-tints and shades by greater or less thickness of color.

Moreover, it is not required to be very thick: on the contrary, the more fine and delicate the image is, the hetter is the plate of copper, and the quicker, also, is it formed. The color once dried should adhere to the plate, for without that there would be deposited under it a thin layer of copper, which could be removed only by means of nitric acid.

In some experiments, the author mixed formiate of silver with the color, and then gently heated the plate: there was thus formed on the surface, points of reduced silver, good conductors, which hastened the the deposition; but as has been said above, this addition is not necessary.

As regards the precipitation of the copper, M. Jacobi's apparatus may he used, or else a copper trough with a square of parchment, such as Steinheil constructed according to Daniel's method, or else the apparatus described by Mr. Spencer.

The employment of M. Jacobi's apparatus presents the inconvenience of the horders of the plate, by the effect of the continued action, increasing much in thickness, and forming, especially at the angles, thick *pads*. Besides, if this plate he not often turned, it does not acquire an equal thickness, and a certain degree of skill is required to prevent the vegetations which have a tendency to be formed. A copper trough is convenient, but it hecomes covered with copper by frequent use, which causes it to require recasting, on account of the inequalities which are gradually formed in it. There is also deposited more copper than is necessary. An apparatus which Herr Von Kobell used with advantage, consists of a glass or porcelain vessel with a flat hottom, the edges of which are two or three inches in height. At the bottom of this vessel is placed a plate of copper, to which is rivetted, for a conductor, a strip of half an inch in breadth, but at a right angle. This strip is isolated with wax, except at the upper part.

The plate should he large enough to pass by about half an inch round the drawing

* *Journal für prakt. Chemie*, 1840.

† On copper it may be drawn with a pen with a solution of persulphuret of potassium. The black marks may he washed off while wet, and the drawing remains visible by a kind of corrosion.

which is placed underneath. On the plates is placed a stretched sheet of parchment, which rests on three feet, of a quarter of an inch in height, or else a *tambourine*, in which is put a plate of amalgamated zinc, which is kept at a distance from the parchment, by means of two transversal glass rods. In order to establish the union, a plate of copper, fixed to a strip of copper half an inch broad, is made use of; this plate, which is a little less than that of the zinc, is placed on the latter. The metallic strip dips into a trough containing mercury, as well as that which is fixed to the support of the drawing, or else the two strips are tied together. The use of mercury requires attention, for if it falls on the lower plate of copper, which it may easily do, an amalgam of copper is formed, and the plate is deteriorated. A wire cannot he employed with the same advantage, for the precipitation is perceptibly weaker. The glass vessel is filled with a concentrated solution of suphate of copper of commerce, until the square *dips*, then a little very dilute sulphuric acid is poured on the zinc. Round the plate, crystals of sulphate of copper are placed; the acid solution is also occasionally changed, and the corroded plate of zinc replaced by a new one. The small deposits of copper, which attach themselves to the parchment, may he removed; and, if they become too frequent, the sheet may be changed. We may also, instead of the *tambourine*, use a trough of half baked pipe-clay, which allows the liquids to transude, hut the precipitation is then more slowly effected.

Herr Von Kobell obtained, in from four to six days, by the method we have described, plates of four inches square, and more than a line in thichness, without any remarkahle inequalities. If any he found, the plate is withdrawn, dried with blotting paper, and filed very smooth.

III. PHARMACY, &c.

MEDICAL REFORM.

Another session of Parliament will leave the matter of medical reform just in the state that we anticipated. The subject is one which embraces so many objects, and such conflicting interests, that we heartily commiserate the misfortune of the individual who undertakes to legislate in so hopeless a cause. Forlorn, indeed, is the prospect of any one who engages in the arduous enterprize of reforming a profession in whose ranks is to he found every gradation, from absolute ignorance and quackery, to the most distinguished eminence of scientific attainment—a profession containing certain classes, who, like the renowned Hygeist, administer at one dose, to a single individual, as large a quantity of medicine as would serve Hahnemann and his disciples for a million.

Well, indeed, will that man deserve of society, who succeeds in placing the profession of medicine on a respectable, or even decent, footing; for, we fear, it will be long before any stop is put to the present system of fraud and humhug. Every cheat and impostor can practise his delusions, or vend his nostrums, whether he be armed with a certificate or not, and it little matters to the public (who are the sufferers), whether they are duped and deprived of health by the illiterate apothecary, or hy the Jordans, the Eadys, and the Morisons: we hold the lower rank of the profession to be as injurious to both the public and the profession, for to the one it is the means of depriving them of more able relief at a cheap rate, while from the other it takes that business which is the due reward of superior education and higher attainments.

In this brief sketch we may take a review of the three divisions of medical practitioners, viz., physicians, surgeons, and apothecaries. It is quite clear that the higher ranks, viz., the physicians and surgeons, are not the instigators of enactments to change the present state of the medical profession by measures which are termed hy their projectors Reform.*

The physicians, as a body, are beyond douht most to he relied on. They are required to possess a good classical education, and a certain amount of physiological and pathological science; although we are aware that in these branches they are very far from profound, and in anatomy, generally very superficial, yet the public has in them an ample protection against palpable ignorance and risk of utter disqualification. It is nevertheless to be regretted that instead of writing prescriptions in the very worst Latin, they are not content with plain and intelligible English, and that instead of attempting to give the precise chemical name to every compound in the Pharmacopœia, they do not pay more regard to the safety of their patients, and observe more caution

* This, we think, the apothecaries would best effect, by beginning at home, and increasing their classical and professional knowledge,—in fact, by first "setting their houses in order;" and no douht the other branches will keep pace with them.

against ignorance and inexperience in the person who may have to dispense them. This body, with the exception of its exclusive and monopolizing system, is certainly the best regulated and least meddling of all the divisions of the professions, and we should earnestly advise the sick at once to refer their cases to any distinguished physician, and get the prescriptions compounded at a respectable chemist's, as by far the most effectual and economical mode of getting relief from their diseases.

As a corporate body, the surgeons are by no means either so well educated, classically or scientifically: for, with the exception of the few who are destined for hospital or operating practitioners, the main body is composed of such as are also obliged to exercise the calling of the apothecary, midwife, and even chemist, keeping an open shop, and selling by retail. To such, an appeal is very seldom made by the more aristocratic part of the community in any important cases of surgery, and even by the lower classes, he is never called on, nor entrusted, to perform any important operations.

We contend that there ought to be a legal power by which to prevent the practice of surgery by any impostor who has the audacity and presumption to deceive the community. No person can be aware whether he is a member of the College, unless by reference to the list;* we therefore advise the members of the College to write on their doors and cards, M.R.C.S. There is no law to prevent any person, *not a member*, from exercising the art of the surgeon; he can only be proceeded against if he is guilty of mal-practice, and for this the *regular surgeon* is *equally liable* to legal proceedings. Means to protect the surgeon against this invasion of his rights certainly ought to be provided by the legislature: we do not mean by any act compelling the individual to submit to the farce of an examination at that libel on a scientific body—the Lincoln's-inn Exhibition, now, fortunately for society, on its last legs,—but by a well organized plan of education and examination in every branch connected with this part of the profession, without which no one ought to be allowed to exercise the art of surgery any more than medicine.

We now proceed to notice the situation of the apothecary, who, in relation to the other members of the profession, enjoys advantages far beyond them, save and except the grade in society. He has at command all the branches of the healing art, viz., medicine, surgery, midwifery, and the dispensing of medicines, and selling of drugs, and yet is he perpetually brawling for medical reform, and crying out against chemists for advising in cases of instantaneous urgency, and among the poor who cannot afford his charges,† and who, but for the chemists, must go without advice, or, what is worse, apply to dispensaries.‡ What security has the public in the qualification of the apothecary?

Little faith is to be placed in the examination of the students at Apothecaries' Hall: the persons entrusted with the office are too eager for gain and patients, to take any interest in acquiring the knowledge requisite to lay down an efficient mode of inquiry into the qualifications of the applicants for certificates.

Qualification, alone, we contend, ought to be made the passport to privilege, and it is this that the legislature ought to enforce with the strictest rigor, and is the best and only reform required.§

We should rejoice if we could give the apothecaries credit for the same laudable and generous spirit displayed in so liberal a manner by the chemists at the late meeting, at which they declared their wish and determination to obtain such knowledge as is necessary to ensure the public safety, their own advancement, and security against the insults and taunts of general practitioners, in whom we have never seen any thing worthy of the name of science. It is very easy to demonstrate to the satisfaction of our readers the little confidence merited by general practitioners; take for instance the art of midwifery. In almost every case where nature steps out of her ordinary

* It is our intention shortly to publish a list of all the apothecaries practising surgery in London without a diploma.

† Hapless are the poor creatures who apply to these men: they are drenched and charged, and, as we too well know, if they cannot pay them,—and what poor mechanic or labourer can?—are summoned in scores to the petty courts, and made to rue their fate: such practices we have too often seen among the low fraternity about Shoreditch and Ratcliffe Highway.

‡ In these places much reform is required. What will our readers think of medicines being given in a piece of newspaper, and the patient told *verbally, not in writing* to divide the powder into six or eight parts? Is this the way to administer medicine?

§ In Dr. Forbes's plan for remodelling the profession, upon the basis of education, we feel glad that he has advocated what we have been contending for for sixteen months. Any other method will leave the matter in a worse state than at present. We protest, however, against any reform confided to either college. These corporate bodies have too long humbugged the public and profession, and we view them with the same obliquity as we do the court of aldermen.

course, and the least difficulty presents itself, the nearest physician is sent for, and the case is entrusted to him as one requiring a consultation; whereas it is mostly such as a person, educated as he ought to be compelled to be, should possess the power to conduct alone. With such men what is the situation and risk of the patient, if some of the many casualties such as flooding, &c. occur in the course or progress of the labor? We have often been called to cases where the practitioner in large business did not even know the membranes when he saw them, and which in great part be bad bunglingly left behind through want of knowledge of the proper mode of conducting the case.

We also urge, as most imperative, that every practitioner ought to have a proper classical education, as this being the business of early life, will greatly contribute to form in him habits of reading and study, and give him the deportment of a gentleman—a quality very much wanting in the medium ranks of medical men. The education of these men, with regard to literature as well as science, is grievously deficient, and has tended more to degrade them than any other causes; for we have always found the generality of them dunces in the one, and smatterers in the other, and we are convinced that without their services at all, the public would not only be uninjured, but benefited.

We now proceed to consider the part Chemists and Druggists are to take in the grand schemes of Medical Reform, and we may here remark, that they have evinced a liberality and a spirit of generous emulation far superior to their traducers and maligners. They openly avow their desire to receive a suitable education, and to undergo such an examination as will protect the public from the dangers of incompetence. What more can the apothecaries want? What more can be expected of chemists? It is stated "that thousands of children are annually destroyed by them;" an assertion which we at once denounce as a palpable falsehood, and were it even true, by far a greater number of children and adults too are annually sent to the grave by the ignorance and quackery of the "gallipots, who now, as in the days of Shakespeare, seem to have but a very low grade in the scale of scientific men.

Now is the time for exertions on the part of chemists to maintain their rights, and to increase their claim to public respect and confidence. We earnestly advise them to form themselves into a body, or societies, not the less honourable because it may not be a corporate one, nor at all approximate the Turners and Saddlers of Magog Hall. Chemists have nothing to do with civic trumpery or common council deliberations; they better suit those whose tastes and pursuits tend to traffic, not science.

We advise them in such an association to form bye laws, to enforce the study of chemistry, botany, materia medica, and pharmacy, as necessary to enable their pupils and assistants to conduct their business with better success; and in a very short time, we are satisfied, they will reap the reward of such a course, and put their enemies to flight.

MEDICAL REFORM AS AFFECTS DRUGGISTS.

To the Editors of The Chemist.

Gentlemen,

On the 17th,* as we are informed, the "one faculty" legislators are to make their second demonstration. The druggists will no doubt be on the alert to frustrate any attempts that may be made of a smuggling character. Their opposing attitude on the first occasion seems to have overawed even Mr. Hawes himself. But why should the druggists be put to the expense and degradation of merely opposing such proceedings? Why do they not rather manfully originate some measure of their own? The conjunction of the medico-political planets of the present crisis is most felicitous towards them. The index finger of events is actually pointing to good fortune, rather than to that annihilation which their jealous rivals seem sighing for. The druggists are not to be extinguished by Act of Parliament: that impulse which of late has been given to British intellect, in the mechanical and other practical sciences, has not so completely passed by them, as to leave them without considerable advancement. A field is also widening every day for the labors of the much-abused prescribing druggists; a new era has dawned upon them, and they are every day becoming more fitted for the duties required by the change. With the poet they may fairly say—

"Tempora mutantur, et nos mutamur ab illis."

None ought to be better aware than the Medical Journalists themselves, that the very men picked out just now as the fair game for their ridicule and abuse, are precisely the men that are destined, at no distant period, to be lifted up into an inferior, but lawfully qualified grade of *medical practitioners*. Some may dream themselves into a persuasion of strange theories respecting a "one faculty," but it is a notorious fact, *in practice*, that the science of medicine is a very divisible science, not only in kind but also

* Our correspondent's letter was received on the 15th, two days previous to the debate.

in degree. A man, for instance, capable of undertaking the cure of any matter, "from a corn up to a consumption," has a fair right to consider the "one faculty" as centred within himself; but will he contend that no man can cure a corn unless he can also hold the tight rein upon a galloping consumption? No candid person will deny that there are thousands of the smaller ailments of life (particularly among the working classes), where a high standard of intellect and education are *not* required. People do not, in the general way, incur the expense of a steam-engine to do the work of one pair of hands and in the trifling (majority of) cases of what may be called "home practice," an expensive medical education is not called for, *nor can it be afforded.*—I now come to consider the actual position of the chemists and druggists at the present time. Entrusted through a long period with the preparation of medicines for the highest grade of practitioners in this country, their duties between the patient and the physician have ever been of an important kind; not only confided in most fully by the physicians, they have also enjoyed no small consideration of friendship and respect from that eminent body. What then would be more consistent or natural, than that they should seek from *them* some public and sanctioned qualificatiou? We are the servants of the College of Physicians, they, on the other hand, are also our friends. They have to perform the higher functions of sagacious counsel; we, the more menial ones of directing its application. To our own masters, therefore, we ought to be capable of standing or falling; but not to be the subjects of insult and interference by an order of medical men altogether distinct and separate from us.

The gentlemen of "1815," although shooting originally from the same reputable stock as ourselves, have ever shown a degree of uneasy pride and restless ambition; dissatisfied not only with their "rights and privileges," but ashamed of the very name of their calling, (if we may judge from that small latin contraction written on their cards and *shop fronts*—I mean the word "&c.," which, when done into English, signifies an apothecary!) I would propose that these gentlemen should henceforth dub themselves with some more lofty title; and if so, perhaps they will allow us to dress ourselves up in their cast-off garment; for, in fact, it has not been much worn, and was not a good fit from the first. But the junior practitioners must then give up the fine shops, the perfumed oils, and grease of the bear; the seniors should also bid a long, though painful, adieu to the

"Green earthen pots, bladders, and musty seeds—
"Remnants of packthread and old cakes of roses!"

Would science be impaired in its growth by a removal from the grease and the perfume? Would pharmacy be crippled in its resources if taken from that place called the "surgery" into the well-appointed druggists' shops? The chemists and druggists are, in fact, the only real and proper apothecaries; and as they derive the most important part of their trust from the College of Physicians, I think it would not only be consistent, but highly respectable and advantageous, if they could be made amenable to the College of Physicians by a license as *their* apothecaries, for the preparing and dispensing of medicines and drugs, and in the process of time by undergoing an examination (as light as may be compatible with their trust), for the treatment *at home* of trifling cases of disease. They might also, with some propriety, be termed "Licensed Apothecaries of the College of Physicians."

Connected with this subject, I would remark, that the college has, on a late occasion, signified its willingness to undertake a general supervision of the medicines contained in the druggists' shops. This regulation, most likely, would not meet the approbation of *some* of the druggists. But by the respectable portion—and I firmly believe the majority—it would be hailed as a regulation tending to exalt their character in the eyes of the public. At all events something of the kind must be done; and it would be better left to the gentlemen of kindly character and feelings, than to impudent and tyrannical upstarts. Heaven forbid that it should ever be a Wakleyan inquisition!

I remain, gentlemen,
Yours respectfully,
March 15th, 1841. W. G.

MEETING OF DISPENSING CHEMISTS AT BRISTOL.

The following has been forwarded to us for insertion, by Mr. Humpage, Hon. Sec. to the Bristol Committee:—

At a meeting of the Chemists and Druggists of Bristol, held at Mr. Humpage's Medical Agency Office, on the 2nd March, 1841, Mr. Knight in the chair, it was—

1st, Moved by Mr. Ferris, seconded by Mr. Martin, and resolved,—

That the thanks of this meeting be given to the Committee of Druggists in London, for their spirited and successful opposition to Mr. Hawes's obnoxious bill, which threatened interference with their acknowledged and established rights.

2nd, Moved by Mr. Giles, seconded by Mr. Canning, and resolved,—

That this meeting has heard, with much pleasure, from Mr. Humpage, that a sub-committee has been formed in London, with powers to adopt measures which may be considered necessary to maintain their rights and privileges as chemists; whilst at the same time this meeting is anxious to aid any bill tending to free the trade from existing abuses, and by a regular qualification and examination to render it respectable in he highest degree.

3rd, Moved by Mr. Black, seconded by Mr. Aldridge, and resolved,—

That a subscription be immediately entered into, and that a portion of the amount be remitted to R. Pigeon, Esq., as Treasurer of the London Committee, for general purposes.

4th, Moved by Mr. Ferris, seconded by Mr. Butler, and resolved,—

That a committee be formed of all subscribers, and that Mr. H. Knight be requested to act as chairman, Mr. Humpage as honorary secretary, and Mr. Canning as Treasurer.

5th, Moved by Mr. Clift, seconded by Mr. Giles, and resolved,—

That the best thanks of the meeting be given to the chairman for the efficient performance of his duties, and that he he requested to forward a copy of the resolutions to the Central Committee.

(Signed) HENRY KNIGHT, Chairman.

REFUTATION OF THE HOMŒOPATHIC DOCTRINE OF HAHNEMANN.

BY M. P. H. HARPER.

Had it not been that homœopathy arose when the doctrines of Brownism were at their height, and when people began to get tired of the absurd doctrines therein developed, it never would have been known beyond the sphere of Hahnemann's own circle. The absurd doctrines which it sets forth would never have found place, except among persons incapable of thinking for themselves; and though, no doubt, like every other wild scheme, it has in the end been productive of some good, in calling the attention of physicians to the unnecessary and absurd length, and useless and unchemical combination of their prescriptions, and to the largeness of their doses, yet it would never have "spread like cholera" throughout Europe, nay, almost the world.

All that Hahnemann ever said or published amounts only to assertions; he has rejected all that was before received, without giving us any thing in its place, except a list of the effects of remedies upon the healthy subject; and on this the homœopathic physician is to found his rules for treating any given case. Of the pathology he has given us only a few fragments, and of a system of therapeutics, nothing.

Diagnosis likewise remains unnoticed: indeed he entirely rejects all division of diseases, and, consequently, their division under generic terms, the doctrine of crisis, &c.

They regard only the particular pains and debilities of which the varieties of sickness are composed. The proximate causes are likewise overlooked, though the remote causes are more studied, at least in relation to diet. Homœopathy is thus in direct opposition to the Hippocratic system, which has existed for twenty-two centuries.

We will now proceed to the more immediate object of this article, viz. an examination of the papers of Mr. Young, which lately appeared in the "Chemist." The first thing requiring notice is, "Hahnemann argues that all diseases proceed from derangement of the dynamic power or vital force, and that the cause (that is, the mode in which external objects, exposure, &c., act upon the vital energy) must for ever remain hid to the human intellect." Good! No physician pretends to say that he can always find out the proximate causes of all diseases, but to refer them all to dynamic power, is contrary to reason. Because all, or most diseases, are attended with more or less derangement in the circulation. I suppose Hahnemann would always lay the cause there. Let us allow, for an instant, that it is so; it is well known that in many cases of derangement of the intestinal tube and stomach generally, there is great shortness of breathing, cough, and other signs of derangement of the organs of circulation, or of the dynamic power, and that all these symptoms are easily removed by an active aperient. Now would an Homœopathist pretend to say that the derangement of the dynamic power first produced the derangement of the intestinal tube, when all the symptoms of its derangement are altogether secondary, and immediately relieved by removing the cause, viz., the derangement of the intestinal tube? Would he say that a violent attack of colic, or of gall-stones, or of calculus in the bladder, proceeds from derangement of the dynamic power? What becomes of the well known sympathy existing between distant organs? Are the actions and powers of the nervous system of no use? I say then, it is impossible for all diseases to proceed from derangement of the dynamic power.

The next thing requiring notice is, the general observation, proofs, &c., in support of their favourite motto and foundation stone, "similia similibus curantur"—a doctrine equally untenable with the last. Homœopathy assumes that the different articles of

the materia medica, when administered to healthy persons, induce disease, and that the disease occurring naturally, can be cured only hy the aid of medicine capable of exciting those symptoms most nearly resembling those of the disease, but which occur with greater intensity. Sulphate of quinine, they say, is capable of producing symptoms closely resembling those of ague, for which it is a specific—mercury is capable of producing both local and constitutional symptoms closely resemhling syphilis, and so on. We will just suppose a case or two. A strong healthy man is attacked with violent pain in the bowels, excessive tenderness on pressure, violent vomiting, &c., and accompanied with a strong full bounding pulse. Now all these symptoms are speedily relieved hy bleeding two or three times, to twenty or thirty ounces, and strong antiphlogistic treatment altogether. How would an homœopathist have treated such a case? By giving perhaps the sixtillionth of a grain of arsenic, that being the drug which produces symptoms nearest resembling those of enteritis or peritonitis? Or again, a man is in the lowest stage of typhus fever, with coma, delirium, excessively rapid and feeble pulse, the tongue brown, and the teeth covered with black sordes, &c., all requiring the free use of wine, brandy, ammonia, and other strong stimulants to give him the slightest chance. How would an Homœopathist treat him? Give him perhaps the billionth of a grain of opium, and nothing else!!

Why does it not act as it ought to do, if there were any truth in it, with as much certainty in apoplexy or pneumonia, as it does in the safe ground the Homœopathists occupy, of the chronic diseases of the nervous system, in hysteria, and in all the varied forms and hydra-headed kinds of dyspepsia, in which the merest tyro knows that oftentimes imagination acts with far more power than the most potent drugs?

With respect to the cases quoted from the *Lancet* in support of this motto, I can only say, that from the beginning of last January to the end of September, we constantly had cases presenting themselves, sometimes to the amount of eighteen or twenty a week, in which the following symptoms were present. Profuse salivation coming on gradually, sometimes to the amount of several pints a day, with sore and ulcerated mouth, tongue and gums, fetid hreath and signs of disordered circulation. In not a single instance could we trace a single particle of mercury having heen given in any way. They were all speedily relieved by attention to the secretions and alum gargles.

The next thing requiring notice is the amount of doses given by Homœopathists. They altogether hanish from their list of remedies, bleeding, blistering and purging—remedies which have always heen looked upon as the main props in the cure of disease. The ten millionth of a drop or grain, say they, produces a power and energy, so perfectly in the inverse ratio of the quantity, that many of the chronic cases of disease require the dose to be augmented a thousand fold lest the tremendous energy of the minute dose should overcome the patient instead of the disease, and produce death to the victim or the doctrine hy the overwhelming smallness of the dose. Indeed I think that the infinitesimal doses of their medicines might almost confound the mathematical acuteness of an Euler or a Laplace.

I will endeavour to shew by means of figures the absolute absurdity of these, and shall take two of their remedies, viz., mercury and capsicum for that purpose. Hahnemann says, that the dose of the first is the sixtillionth of a grain: now it appears very easy to talk about the sixtillionth; but when it comes to figures, an unit with a train of thirty ciphers is rather a formidable thing. The population of the world is computed at 800,000,000, and supposing every person to swallow an homœopathic dose once a second, it would require upwards of 27,000,000 of years for them to get through the thousandth part of a grain.

For the following calculation with respect to capsicum I am indebted to a paper hy Mr. Smith, in the *Medical Gazette*:—

"The area of the great pyramid of Egypt is 480,250 square feet, and its height 500 feet, its solid contents are 80,041,666 cubic feet. Say we have 378.875 minims of spirits of wine in a cubic foot, divide the trillion by this numher, and the result is, that we have $2\frac{1}{2}$ hillions of cuhic feet in a trillion of minims; extract the cube foot, the result is 13,758 in feet, which will he the length of each side of a cuhical vessel which will hold a trillion of drops of spirits of wine, viz., it must be above two miles and a half in length, and the same in width, and likewise in height, or, comparing it with the great pyramid, it would require above 32,600 pyramids to contain the spirits of wine to dilute one grain of capsicum."

This all sounds mighty well, indeed, hut it is no joke? Can any person with only that amount of common sense about them, recommend such doses for the use of disease? I should think not. Again, how is it that the doses which we are constantly taking in the ordinary necessaries of life do not act in the same way? Water contains sulphate of soda with the other in minute proportion. Now, hread is made up of a small proportion of water, consequently the doses of the salts approach nearer to the homœopathic doses: how then is it that they do not act?

Other instances of the same sort must oc-

cur to every body in an instant, so that there is no need of repeating them here. But Homœopathists account for the extraordinary action of their doses in two ways—first, by development of electricty, and, secondly, hy acting on the exact part diseased. With respect to the first, supposing that electricity is developed during the trituration, how is it retained in the molecules of the medicines, when, as is well known, electricity, however developed, has an overwhelming tendency to discharge itself through the surrounding objects, so as constantly to preserve an equilihrium. How then can it be? As to the other reason, perhaps they will be good enough to show us the exact seat of the disease in fever, hydrophohia, chorea, or tetanus; by so doing, I am sure they will confer a lasting benefit on hoth patient and physicians.

But the Homœopathists may say—Well, we succeed in curing our patients: how is that, if our doctrine be so absurd? Granted, but how do they succeed? First, hy inspiring great confidence in their remedy. I think, if memory fail me not, I have seen in an old numher of the *Lancet*, the case of a lady who, having consulted an Homœopathic doctor, who gave her a box of globules, which, on going home, she placed on the mantle-piece, where were also some fulminating halls in the same sort of box, and hy mistake she swallowed all the latter, and got well, though the Homœopathic remedy was untouched. Here, then, was the effect of confidence in the remedy. Secoudly, by being excessively strict with respect to diet; with respect to which physicians generally are sadly lax, though there is no disease which is not benefited hy strict attention to it. Thirdly, the greatest thing in medicine is to know when to do nothing. A well directed pause in the treatment often hastens, and almost completes, a cure; and though the patient may not like such a manœuvre, yet it is hy pausing at the right time, but still pretending to do a great deal, that Homœopathists sometimes succeed, in cases which, if left to themselves, would soon be well.

I think, then, that we may conclude this doctrine to be at variance with every rule of inductive philosophy, and of the causation of disease. A doctrine setting forth that the effect is greater as the cause applied is less, and leaving no explanation of a case where a cure is effected, otherwise than by regulating diet, and the natural restorative powers of the living system, with the imagination of a confiding, but deluded, patient; and a doctrine full of absurd and untenable dogmas.

I think that eventually people's eyes will he opened to its absurdity, though it undoubtedly has had, and yet will have, numerous proselytes; and it is only that chemists may have an opportunity of judging both sides of the question that I have been induced to write the above.

ERRORS IN DR. THOMSON'S CONSPECTUS.

To the Editors of The Chemist.

Gentlemen,—Having read the attacks on the Conspectus which have appeared in your work, permit me to offer a few remarks on the last of them, which appeared in your March number. In doing so, it is not my intention to defend any errors which may be detected in the Conspectus; on the contrary, I lament that any should be found in it; but when it is recollected, that the object of that little hook is merely to supply an aid to the memory of the prescribing practitioner, not to be a guide for the pharmaceutical preparation of drugs, the danger to life, which your correspondent, who may be justly regarded a microscopic critic, has declared to depend on the errors he has pointed out, will he acknowledged to he neither so great nor so threatening as he has stated.

The errors crept into the edition before the last, which appeared at a time when I was lahouring under very bad health, and was obliged to travel on the continent on that account. The correction of the press was left to a friend, who was less familiar with the inspection of proofs than I supposed him to he. As soon as I was made aware of the errors, those that were pointed out were corrected in the subsequent edition of the works, which appeared in the commencement of 1840; hut it had passed through the press, before the new edition of the Edinburgh Pharmacopœia came to my hands. It is not likely, therefore, that your correspondent will find any of the new formulæ, or the corrections of those that have been altered, or the change of names contained in the present edition of the Edinburgh work. I have completed the materials for a new edition of the Conspectus, into which the alterations of the Edinburgh College are interwoven: and as I shall be ahle to superintend the press myself, I shall feel greatly mortified if even your microscopic-eyed critic shall light upon a single error.

Fair play is a right which every author merits, and in asserting myclaim to it, I may state, that your critic will find that the following errors which he has set down do not exist in the Conspectus of 1840.

In p. 5, in the formula for Hydrocyanic acid, Ojss of water is ordered, not Ofs as mentioned by the critic.

P. 30, Ceratum Hydragyri comp. is *not* omitted.

— 39, Decoctum Amyli *will* be found.

— 56, Ferri-Ammonio-Chloridum is *not* called Ferri-Potassio-Chloridum.

— 132, Tinct. Balsami Tolutani *is* mentioned.

— 134, Tinct. Colchici comp. *is* noticed.

— 136, Proof spirit, *not* rectified, is ordered by the College for tincture of opium.

I think the worthy critic also has gone too far, in stating that I have ("*oftener!*") retained the old names, than adopted the new, and confounded the names of the different colleges. His accusation that I have left out some of the officinal preparations, I can readily bear; for as the work is a mere memorandum-book, as already stated, for prescribing, the mode of preparing the articles, in many instances, affords no information of use to the prescriber.

To show how easy it is to make mistakes, this critic, in reference to Liquor Potassæ, has mentioned gr. x and gr. xv, instead of ℥ x and ℥ xv; and this in noticing only twenty-four articles; yet, he regards it wonderful, that errors should have crept into a list containing upwards of a thousand.

Most of the errors which he has pointed out are of little consequence in a practical point of view. I do not mean, by this remark, to defend them, for whatever may be the intention of introducing the quantities in the formulæ, I admit that, when introduced, they ought to be correct.

Nothing, Gentlemen, is so easy as to find out the faults of any work—to pick holes in the doublet of any author: let your correspondent try the task of compilation, where the matter is of the varied character contained in the Conspectus, and he will be ready to join in the supplicatiou of Pope's admirable universal prayer—

"That mercy I to others show,
That mercy show to me!"

I remain, gentlemen, yours respectfully,
A. T. Thomson.

[We are glad to find that Dr. Thomson is about to publish a new edition of his Conspectus, and that it will be free from the errors which the "Critic" has pointed out. It would be a pity that the usefulness of such a work, in which accuracy is indispensable, should be in any way diminished, by incorrectness even in trifles. There is, perhaps, no writer whose works are of such utility to the junior practitioner and dispenser as those of Dr. Thomson. We regret, therefore, that any inaccuracy should be found in one of them. The next edition will, we feel confident, be correct in every particular.]

ADULTERATION OF BALSAM OF COPAIBA.

To the Editor of The Chemist.

Gentlemen,

As the adulteration of Balsam of Copaiba is practised to a considerable extent, by both wholesale and retail dealers, may I beg you to give publicity to the following test, which will at once determine the genuineness of the article:—

Agitate one part of the suspected Balsam with two parts of liquor ammoniæ; let them remain a few hours; if the mixture continues milky, the Balsam contains castor oil.

I remain, Gentlemen,
Respectfully yours,
George Tyrer.

Liverpool, March 16, 1841.

JAMES'S POWDER AS A CURE FOR THE DISTEMPER IN DOGS.

To the Editors of The Chemist.

Gentlemen,

It may be satisfactory to such of your readers as have favourite dogs, to learn that the distemper may be cured by means of James's Powder.

I have recently had a Newfoundland dog attacked with this distressing disease, and being most anxious to save him, I employed a skilful veterinary surgeon to attend him. He usually came with his son, who has the reputation of being very clever in dog diseases. After the few first visits, a third person came with them, and held a consultation on the dog's case. These visits were daily repeated. Notwithstanding, the poor dog daily became worse and worse, till the fourteenth day, when, an unfavorable change having taken place during the night, they pronounced his case to be hopeless; adding, that it would be cruel any longer to torture the poor brute with drenches.

The treatment was as follows:—

A warm bath daily, at the temperature of 93°; and thrice a day a ball composed of tartrate of antimony and extract of aloes. This was, however, preceded by taking 4 ounces of blood from the animal.

The case having been at length pronounced hopeless, I sought advice among my neighbours; from one of whom I learned that James's powder would effect a cure, although this was, as I have before stated, the fourteenth day of the attack; and the surgeons declared that, agreeably to their experience, he must die on the seventeenth day.

Following the second advice, I administered 4 grains of James's powder night and morning; and, as occasion required, one tablespoonful of syrup of buckthorn.

On the sixteenth day, the nose, which had been previously stuffed up with mucus, began to discharge: and the breath, which had been very cold, was increased in temperature. We looked forward to the seventeenth day with considerable apprehension; but, on that day, the dog was evidently bet-

ter; his appetite had improved, and I still, as heretefore, continued to feed him upon bread sopped in warm milk and water. On that day, also, his eyes almost recovered their natural clearness; and on the nineteenth day, they presented an unnatural dilatation of the pupils. Whereupon I discontinued the James's powder, which I never afterwards had any occasion to repeat.

Day after day passed, and the dog improved in health and strength; and on the twenty-first day, he was able to walk across the stable, though, in doing so, he tottered and fell from excessive weakness. He slept well and had a good appetite; and on the thirtieth day, I gave him a mess of stewed flesh, which I repeated once a day till his appetite was so voracious that, on one occasion, he devoured four pounds of meat. By degrees this desire of food abated, and at the end of six weeks, the dog was able to be exercised out of doors, and he had acquired strength sufficient to gallop. He was now suffered to go at large in the day time, but was shut up whenever the weather was rainy, and always at night.

Five months have now elapsed since the dog was given over by his first medical attendants; and he is now in the enjoyment of robust health, saving only a slight spasmodic catching of the muscles about the loins, which, however, does not appear to give him any uneasiness, and is only apparent when he sleeps.

If you think that this case would be suitable to your excellent periodical, and would be useful, I trust you will give it a place.

I am, Gentlemen,
Your obedient Servant,
A Subscriber.

N.B.—If it were insisted that on the 17th day a crisis was to be expected, and that it must prove either fatal or otherwise to the dog, I may answer that the amendment took place within six hours after the first dose of James's powder was administered; and this I consider conclusive, seeing that that first dose was given to him on the 14th day.

BLISTERING TISSUE.

To the Editors of The Chemist.

Gentlemen,

A very great improvement is being effected in the mode of vesicating, which, when generally known, will, in a great measure, supersede the old method of blistering. Tissue paper is now smeared over with an adhesive solution of cantharidine, and this is applied to the skin, and bound down tightly, so as to keep it in a proper position.

I am not aware that chemists generally prepare the tela vesicatoria, as it is termed, but I think that the profession should endeavour to introduce it, not as an exclusive preparation, but (as it is likely to be used in preference to the emplastrum lyttæ) as a general and easy method, for the dispenser, and also for the patient.

I wish to call attention to this subject through the medium of your excellent and widely circulated journal, and trust that some of your intelligent readers will devote a little time to the investigation of it, and produce a varnish, capable, when spread upon tissue paper, of adhering to the skin, and producing a blister in eight or ten hours from the time of application.

In prosecution of this subject, under the impression that rectified ether would extract the active principle of the fly, I prepared a strong solution, and after macerating with a gentle heat, for a few days, filtered, and obtained a dark greenish coloured liquid. I carefully evaporated this until reduced to a syrupy consistence, when I applied a portion of it to tissue paper, with a camel hair pencil. It was quickly absorbed, and from the evaporation of the ether, it very soon dried. I cut a piece of this paper, which I laid upon adhesive plaster, leaving a good broad margin, and this I put upon my chest on going to bed. I experienced no disturbance or uneasiness during the night, and upon examination in the morning, slight redness only had been produced.

At present I am considerably occupied with business, but when I have a spare hour, I purpose to devote it to researches on this subject, and as a hint to others (who I have no doubt will also make the attempt to produce the paper), I think, that to obtain the cantharidine nearly pure, and combine it with a simple varnish, will be the most ready and convenient way of reaching the desired point.

I may have occasion again to communicate on this subject: in the meantime,

I remain, Your most obedient servant,
A Retail Chemist.

P.S. Smith, of Edinburgh, at present, is the only maker of it, and his price is most exorbitant for the paper prepared so as to blister.

NITRATE OF MERCURY OINTMENT.

To the Editors of The Chemist.

Gentlemen,

In the last number of the "Chemist," you give a letter from a correspondent, describing a method of making the nitrate of mercury ointment of a beautiful color, and of good consistence, by mixing the solution of mercury with pure olive oil.

There is some mistake here; if pure olive oil be mixed with acid nitrate of mercury, the mixture becomes hard in a few hours, and, indeed, Dr. Paris, in his Pharmalocogia,

gives this as a test, by means of which to ascertain the purity of olive oil, and tells us that, if it be adulterated, it will not undergo such a change.

Hoping that your correspondent will be so obliging as to inform us more accurately how he makes the ointment, of the color, and consistence he names,

I remain, Gentlemen, respectfully yours,
GULIELMUS.

Newcastle, March 6, 1841.

SECALE CORNUTUM.

An Essay on the Chemical, Botanical, Physical, and Purturient Properties of the Secale Cornutum. With an Engraving. By T. H. WARDLEWORTH, SURGEON. London: Simpkin, Marshall and Co.; Bancks and Co., Manchester; and Wrigley, Rochdale. 1840.

THE Secale Cornutum, or, as it is more commonly called, the Ergot of Rye, is very ably treated of in the little work before us.

Mr. Wardleworth has long been known as a respectable surgeon, and he has given in this essay abundant proofs of extensive opportunities of observation.

He treats the subject very fairly, giving the arguments used against the employment of this medicine as well as those in its favor.

The author illustrates his work with numerous cases in his own practice, in which the Ergot was found successful.

We may conclude this short notice by recommending the book to the profession, and our readers generally.

The Touchstone of Medical Reform, in three Letters, addressed to Sir Robert Harry Inglis, Bart., M.P. By JOSEPH HENRY GREEN, F.R.S. Professor of Anatomy to the Royal Academy; one of the surgeons of St. Thomas's Hospital, &c. —London: Highley, Fleet-street, 1841.

We have read with attention Mr. Joseph Henry Green's pamphlet entitled the Touchstone of Medical Reform; and though there is in it much in which we agree, there is still more from which we differ, and we are confident that the general plan is one which will not soon be acted upon. We have long come to the definitive conclusion, that entire reform in the method of education and examinations totally free from the trammels and tyranny of existing institutions will alone secure the respectability and independence of the profession.

TO CORRESPONDENTS.

MR. HAVILAND.—We wrote to the publishers of Dr. Turner's work, on the subject of our correspondent's note; the following is the answer returned to us. We insert it as being the best answer to this and other correspondents:—

"Upper Gower-street, March 12, 1841.

Sir,—The delay which has taken place in the publication of the Supplement to Dr. Turner's Chemistry, has arisen from a desire on the part of the editors to give the subject in the most complete form. The manuscript in German is now finished, and the greater part of it translated. The printing of the Supplement has commenced, and we hope the Part will be ready for publication in about a month or six weeks from the present time. We are, Sir, your obedient Servant,

TAYLOR AND WALTON."

"X. Y. Z."—Yes: Dr. Turner's Elements, 7th edition, 21*s.*, or Brande's Manual of Chemistry, 30*s.*

Will Mr. T. SMITH state more explicitly what he wants?

Mr. T. M. RELPH.—Hot Naphtha. Apply to our publisher.

"T. R. F. C."—Spongy platinum may be prepared by adding a saturated solution of muriate of ammonia to a solution of bichloride of platinum. The platino-bichloride of hydrochlorate of ammonia is precipitated of a yellow color. This salt is to be heated to redness, when the platinum is left in a spongy state.

We wrote to Mr. KERNOT.

"A SUBSCRIBER."—We may recommend Professor DONOVAN'S Treatise, 6*s.*; or GRIFFITH'S Recreations in Chemistry, 4*s.* 6*d.*

The conclusion of M. ORFILA'S experiments on poisoning by arsenic is unavoidably postponed until our next.

"AMICUS."—Decidedly PEREIRA'S.

Letters received from Mr. SWAN, Alnwick, and "A. J.," Durham.

"Alfred Watts," "Late Hours," and "B. B." in our next.

Two Numbers of Edinb. Month. Journ. received.

Nos. I. III. and IV. of THE CHEMIST *being out of print, the Publisher will be happy to repurchase them at the full price, or take them in exchange for any of the other numbers.*

NOTA BENE.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

ERRATA.

No. XIV., page 55, col. 1, line 26 from bottom, by a mistake of the press, "concluded" was put for "continued."

No. XV., page 16, col. 1, line 22 from top, for "ingratitude," read "turpitude."

LONDON: PRINTED BY STEWART AND MURRAY, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

ON THE COMPOSITION OF THE AIR WHICH IS FOUND IN THE PORES OF SNOW.*

BY M. BOUSSINGAULT.

Saussure, during his stay in the defile of the Géant, having examined the air confined in the pores of the snow, thought that it contained considerably less oxygen than atmospheric air. The following, is the manner in which he expresses himself,

"We thought, but rather late, to collect the air which is found contained in the interstices of the snow, and we took it to M. Sennebier in order to analyse it. At Geneva, a mixture of equal parts of atmospheric air and nitrous gas, gave him, twice running, 1·01. The air of the snow tried in the same manner, gave him at one time, 1·85, and at another 1·86. This trial, which would appear to indicate such great impurity on the part of this air, would have required experiments to ascertain the nature of the gas which occupied the place of the oxygen."†

At the time of Saussure's works, eudiometry had made but little progress; however, be its state of imperfection what it might, it would be difficult to admit that such observers as Saussure and Sennebier could be deceived as to the direction of the difference which they had found in the composition of two gases analysed by the same means and in the same conditions. It was this reflection that led me to repeat Saussure's experiment when I was among the glaciers of America.

In a first attempt made by Colonel Hall and myself to mount the Chimboraço, towards the declivity that overlooks Chillapulla, we encountered such moveable and deep snows, that, despite all our efforts, it was impossible to get higher than 5115 metres. It was at this station that I filled a flask, hermetically closing it, with snow. When we arrived at the cabin in which we had to pass the night, the snow was completely melted, the water arising from this melting occupied about $\frac{7}{8}$ of the capacity of the vessel.

Having analysed the air found in the flask, by means of phosphorus, I ascertained that it contained from 16 to 17 per cent. of oxygen.

The former experiment of Saussure, which I called to mind by verifying it on the perpetual snows of the Andes, attracted the attention of philosophers. A German observer, M. Bischoff, in a series of investigations relative to the physics of the globe, which he undertook during an excursion to the Alps, had an opportunity of verifying it anew. He triturated hardened snow under water; the air which he procured by this means, analysed by the eudiometer with sulphuret of potassium, gave only from 10 to 11 per cent. of oxygen.

Until now, these investigations were made in the high regions, on the glaciers. It was desirable, in order to complete them, to examine the air from snow collected nearer to the level of the sea. It was with this view that I made my observations on the snow which fell in Paris at the end of December 1840 and at the beginning of January 1841. On the 20th of December, I heaped up some recently fallen snow in an eprouvette which I placed over a mercury bath.

The compressed snow occupied a volume of 287 c.c.

After fusion, the volume of air disengaged was 109 cub. cent. at the temperature of 4°·5, and under the pressure of 0m.743.

Let it be 104c.c.′ 8 at 0° and pressure 0m·76.

The volume of water was 200 c.c.

The air examined on the 23rd of December, yielded by phosphorus, in the first analysis, 18·6 per cent. of oxygen; in the second, 18·8.

* *Comptes Rendus*, No. 7; 15 Fev., 1841.
† *Saussure*, tom. vii. p. 472.

On the 6th of January, a capsule of the capacity of 127 c. c. was filled with compressed snow. After fusion was obtained :— 43 c. c. of air at the temperature of 1°, and under the pressure of 0m.735.

Let it be at 0° and pressure 0m.76, 41 c.c.4.

One volume of water of 80 c.c.

The air, analysed shortly after the fusion of the snow, contained 19 per cent. of oxygen.

Thus, the air which is disengaged during the fusion of the snow, contains, in Paris, as on the Alps, and as on the Andes, considerably less oxygen than atmospheric air. May it, notwithstanding, he concluded that such is the composition of the air confined in the pores of the snow before its fusion? No, without doubt: and on this occasion I will quote the opinion which I gave in the narrative of my ascension to Chimhoraço, in relating the fact which confirmed Saussure's observation.

"The eudiometric result which I have obtained is certainly free from all objection; hut I think that new experiments are required in order to clearly prove that the air which I examined was indeed exactly that which existed in the pores of the snow before its fusion. Indeed, to procure this air, it is necessary to wait until the snow is melted; the gas of the flask is found in contact with the little or not at all aërated water resulting from that fusion. Now, we know that, under similar circumstances, oxygen dissolves in water more readily than nitrogen, and that the air with which the water is saturated, is richer in oxygen than that of the atmosphere. The air which remained in the flask, might therefore he less rich in oxygen, although, in reality, the whole of the air contained in the snow might have the ordinary composition."*

This is the true explanation of the small proportion of oxygen found in the air procured hy melting snow; it will he demonstrated by the experiments which I have described, when I have completed them by the following observations :—

On the 20th of December and the 6th of January, independently of the experiments which I have detailed, I had arranged other similar ones on a larger scale, in order that I might procure sufficient snow-water to extract the air from it and analyse it. I will mention only one of these experiments.

From 350 c. c. of melted snow, was extracted hy sustained boiling, 12 c. c. of air at the temperature of 3°·2, pressure 0 m. 751. Let it be 11 c. c. 62, at 0° and 0 m. 76 pressure.

This air, analysed hy phosphorus, contained 32 per cent. of oxygen, a result which perfectly agrees with those of MM. Humboldt and Gay-Lussac: they found, indeed, that the air withdrawn from :—

	per cent.
The distilled aërated water contains oxygen . . .	32·9
The water of the Seine . .	31·9
Rain-water . . .	31·0

Going hack now to the preceding experiments, and taking account of the air contained in the volumes of water ohtained, it was found that, although air disengaged from snow contained only from 18·7 to 19 of oxygen, the whole of this air, that is to say, air measured and air dissolved, the volume of which had heen neglected, contained very nearly 20 per cent. of oxygen, or nearly the same as the atmosphere.

There is hesides a much more direct means of ascertaining the real composition of the air from snow. This consists in filling a matrass with snow, and in conducting the operation as in extracting air from a liquid. The following, for example, is an experiment made on the 6th of January :—

350 c. c. of snow yielded 115 c. c. of air at the temperature of 3°3 C. and under the pressure of 0m.746.

Analysed hy phosphorus, this air gave per cent.,

In a first experiment . .	20·3
In a second . . .	21·0

It is nearly the quantity of oxygen found in the air on the same day, and hy the same means.

There was, in my opinion, a certain degree of importance attached to proving the real composition of the air contained in the interstices of snow, for the fact which would establish a smaller quantity of oxygen in it might have heen, from the following considerations, entirely in support of Dalton's hypothesis, which asserts that in the atmosphere, the proportion of oxygen diminishes with the height. If, indeed, snow be considered as a heap of small crystals of ice which are formed in the higher regions, we should he ohliged, in presence of the air which it contains, to conclude that when water dissolved in the atmosphere is condensed into snow, it does not expel that great portion of air which it always disengages on the surface of the earth: "If it were not permitted to suspect,"—say MM. Humholdt and Gay-Lussac,—"that snow retains, confined in its very small crystals, a certain quantity of water."†

Air adheres to snow in a very remarkable manner, which shows that it penetrates to

* Memoire sur L'Eudiometrie, *Journal de Physique*, 1805.

† Memoire sur L'Eudiométrie, *Journal de Physique*, 1805.

the very smallest crystals of ice. Very little gas is obtained by passing snow under a bell glass full of water at 1 or 2° C. of temperature. Air is disengaged in any quantity only when the snow is melted. This intimate penetration of the small crystals which constitute snow, scarcely allows it to he doubted tbat tbe air which is procured from it, comes for the most part from the regions of the atmosphere wbere tbis meteor is formed. According to my aualyses ahove detailed, we are not warranted in helieving that this air has a different composition from that of the inferior regions; at least, the difference, as much as exists, is certainly one of those variations that may arise from errors ofobservation; however, considered with respect to its origin, the air contained in the interstices of snow presents sufficient interest for its analysis to be resumed, when the processes of meteorological chemistry are sufficiently perfect. But hitherto, and by aid of our eudiometrical methods, it must he acknowledged that the results of the experiment do not confirm Dalton's views. Thus, in his memorahle ascension, M. Gay-Lussac having taken some air at an altitude of 6636 metres, did not find in it a different proportion of oxygen from that contained in the air of Paris, with whicb it was analysed comparatively. In the work which this celebrated philosopher made with the assistance of M. Humboldt, he carried the air of Paris to 0·21, and tbis numher scarcely differs from that of the analyses of M. Brunner on the Faulborn, at a height of 2600 metres, and by a process wbich certainly offers advantages over the former methods; M. Brunner found 20·915 air in this station.

In order to complete, as far as possible, the results ohtained as to tbe composition of the atmosphere at different beights, I will detail the results of the analyses, which I made during my stay in tbe mountains of the Andes.

At Santa-Fé de Bogotà, at the altitude of 2643 metres, during the month of April, 1825, tbe oxygen of the air, by Volta's eudiometer, was 20·65.

At Ibagué, at the foot of tbe cbain of Quindiù, at 1323 metres, in December, 1826, I obtained 20·7.

At Mariquita, in tbe valley of the Rio-Grande de la Magdalena, at an elevation of 548 metres, a series of analyses by means of spongy platinum, made in November, 1826, indicated 20·77 for the oxygen of the air.

M. Dumas announced tbat he and M. Boussingault are occupied with a new analysis of the air, in which, instead of substituting the comparison of volumes for that of weights, they would he ahle to answer to a thousandth of tbe true proportion of oxygen which it contains.

ACTION OF AMMONIACAL GAS ON BURNING COALS.—FORMATION OF HYDROCYANATE OF AMMONIA, AND DISENGAGEMENT OF HYDROGEN GAS.*

BY M. LANGLOIS.

In most chemical works it is asserted tbat gaseous ammonia, when passed over incandescent coals, produces hydrocyanic acid. M. Thenard says, according to Clouet, that nitrogen and carburetted bydrogen gases are disengaged, and that a substance, witb the smell of bitter almonds, soluble in water, is formed, wbich has been regarded as prussic acid. Liebig attributes this discovery to Scheele. The memoirs of that illustrious chemist do not point out this reaction: we read in them that bydrochlorate of ammonia added to a mixture of coals and potassa, and heated to redness, gave cyanuret of potassium.

Although the idea of putting ammoniacal gas in contact with coal at an elevated temperature, is more than half a century old, the experiment bas never heen repeated. The formation of hydrocyanic acid, under these circumstances, appeared to me an interestiug fact, and worthy of being verified.

I put some calcined coals in a porcelain tube passing through a reverberatory furnace, and made one extremity of the tube communicate with an apparatus in which the ammoniacal gas was produced and dried hy passing over pieces of quick lime: I adapted to the other extremity an U tuhe receiver, surrounded with a mixture of ice and salt, and bent in such a manner as to carry the gas under bell-glasses full of water or mercury. The apparatus being thus arranged, and the joints perfectly luted, the porcelain tube was heated to redness. The heat of this tuhe being thus raised, I passed into its interior, for about an hour, dry ammoniacal gas. During the wbole of the operation, an inflammable gas was disengaged, which was collected over water more easily than over mercury. When the experiment was carefully conducted, the gas which escaped was accompanied with but a small quantity of ammonia; it carried away only a little of tbe product which ought to have been condensed iu the receiver. The latter contained a great many small prismatic crystals, whose form by no means resembled tbat of crystallised bydrocyanic

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* *Comptes Rendus de L'Académie des Sciences:* No. 5, 1 Fev., 1841.

acid. To collect them, I was obliged to cut the U tube in several places: I detached them with a glass rod, and immediately put them into a flask which I sealed with emery. There was at least 15 grammes weight of them. The experiment can be completely successful only when the ammoniacal gas is very dry, and the coal well calcined. A slight examination proved to me that this substance was not hydrocyanic acid, but hydrocyanate of ammonia. It forms a blue precipitate in the solutions of the salts of iron; the solution of potassa disengages ammonia: dilute sulphuric acid liberates hydrocyanic acid. It is very volatile, turns black in a few days, and the quicker in proportion as the temperature is higher. Confined in a flask kept in ice, it is preserved for some time without alteration. Its stability seems to be greater than that of the hydrocyanate of ammonia obtained by the ordinary processes.

The cause of the production of hydrocyanate of ammonia, by means of coals and ammoniacal gas, can be known only by analysing the gas disengaged during its formation. This gas, obtained over water, is inodorous: it is inflammable; the product of its combustion does not cause any precipitate in lime water. Burnt in chlorine, it gives rise to white sour vapors, without any carbonaceous deposit. In these re-actions, the presence of hydrogen was already recognised, but this gas might contain nitrogen and a little carburetted hydrogen. The only experiment to be made, therefore, consisted in burning this gas in the eudiometer by means of oxygen. I operated over mercury with all the care that such an experiment requires.

I measured in a graduated tube 50 parts of this gas and an equal quantity of pure oxygen. I drove this mixture into the eudiometer, which I closed before sending into it the electric spark. The gaseous residue, again measured, represented 25 parts, or a quarter of the mixture employed: a solution of potassa did not diminish its volume. In order to ascertain that the gaseous residue did not contain nitrogen, I re-produced it by repeating the experiment. I afterwards passed it into the eudiometer with double its volume of hydrogen, and I inflamed the mixture. When the instrument was opened, the mercury rose in it and entirely filled it. Considering this experiment as very important, I repeated it several times, and always with the same success. It proves that the gas which was disengaged at the same time that the hydrocyanate of potassa was formed was pure hydrogen. It is, therefore, an error to believe, with Clouet, that this gas is a mixture of nitrogen and carburetted hydrogen.

Now that we know the nature of the products which are formed when gaseous ammonia is put in contact with burning coals, is it not possible to account for their production? I think so; but must venture to say, that the molecular constitution of hydrocyanic acid, as at present admitted, is perhaps not accurate. As this acid is always obtained by putting cyanogen and hydrogen in contact, in the nascent state, it is natural to suppose that the cyanogen acts the same part in it as halogenous bodies in the hydracids. However, the facts which we have just observed lead us to believe that a nitruret of hydrogen, arising from a combination, may also be combined with carbon, and may produce hydrocyanic acid, without the previous formation of a binary molecule of nitrogen and carbon. We might therefore admit that a proportion of ammonia $N^2 H^6$, in contact with burning coals, is converted into $N^2 H^2 + H^4$, that these four atoms of hydrogen, forming two equivalents, are replaced by two equivalents of carbon, to constitute hydrocyanic acid, $N^2 H^2 C^2$, which immediately enters into combination with a proportion of undecomposed ammonia. In this case the carbon is substituted for a portion of the hydrogen of the ammonia, as chlorine is substituted for oxygen in the metallic oxides submitted to its action, the temperature being raised. Doubtless, also, the excess of ammonia greatly contributes to the production of the phenomenon, on account of its tendency to combine with the acids; without this excess of ammonia, hydrocyanic acid certainly would not be formed.

Under these circumstances is it more easy to explain the formation of hydrocyanate of ammonia, by representing its composition by cyanuret of ammonium? I do not think so. In that case, it must be admitted that one equivalent of ammonia is completely decomposed, that the nitrogen combines with the carbon, and that of the six atoms of hydrogen, four are disengaged, and two combined with a proportion of ammonia to convert it into ammonium. The reaction, thus considered, appears to me too complicated to be true.

The passing of ammoniacal gas over burning coals yields, in a short time, a great quantity of hydrocyanate of ammonia. This process is very simple, and I think it preferable to the others. The salt thus obtained appeared to me, as I have said, more stable than that prepared by saturating anhydrous hydrocyanic acid with ammoniacal gas.

Chlorine instantly attacks it with a disengagement of heat: hydrochlorate of ammonia is formed, as well as gaseous chloride of cyanogen, which I have collected and solidified by receiving it in a flask surrounded

by a frigorific mixture. Bromine has the same action on it as chlorine.

Hydrocyanate of ammonia readily dissolves in water, and does not seem to be immediately decomposed, as stated by Liebig in his Treatise on Organic Chemistry. I even think that this would be the only means of preserving it for any length of time without alteration. It is also very soluble in alcohol, and much less so in ether. It is a most violent poison. Five centigrammes were dissolved in water and given to a rabbit, which, immediately after having swallowed it, uttered a cry and died. I thought it would be interesting to know whether it would act as rapidly on dogs. One decigramme was given to a moderate-sized dog: the animal writhed for a few seconds, then fell down and soon died.

The energetic action of hydrocyanate of ammonia on animals made me believe that ammonia cannot be successfully employed as an antidote to hydrocyanic acid. With this idea I made some experiments which I need not describe, and which proved to me that ammonia acts only by its excitant properties.

M. Gay-Lussac is the first chemist who made known the hydrocyanate of ammonia: he did not attempt, on account of its great volatility, to determine its composition. Liebig says that it is formed of one equivalent of acid and one of base. The salt which I studied having been produced under new conditions, I wished to know if its composition was the same as that of the hydrocyanate of ammonia analysed by the learned chemist of Giessen. As soon as it was prepared, I enclosed it in a small flask which I perfectly sealed and accurately weighed. I dissolved in water a small quantity of the salt which it contained; I again weighed the flask; the weight which it had lost gave that of the hydrocyanate dissolved. By taking these precautions, I had no fear of loss arising from its volatility. The solution of hydrocyanate of ammonia was treated by a solution of nitrate of silver, which immediately formed in it a white precipitate of cyanuret of silver. The liquor was slightly acidulated by nitric acid.

1st. Exp. 0 gr. 090 of hydrocyanate of ammonia yielded dry cyanuret of silver..... 0 gr. 260
2nd. Exp. 3 gr. 082..... 0 gr. 245
3rd. Exp. 0 gr. 170..... 0 gr. 515

The mean of these experiments shows that 0 gr. 114 of hydrocyanate of ammonia produce 0 gr. 340 of dry cyanuret of silver, which represent 0 gr. 068 of hydrocyanic acid. These investigations lead us to conclude that this salt is composed of

One equivalent of hydrocyanic acid 342·389
One equivalent of ammonia..... 214·478

Its formula, therefore, is—

$$C^2\,N^2\,H^2,\ N^2\,H^6.$$

ON THE ACTION EXERTED BY POTASSA ON CAMPHOR.*

BY M. Z. DELALANDE.

Setting out from the point of view which guided MM. Dumas and Stass in their experiments on alcohols, I tried whether camphor, which, in some of its reactions, is somewhat analogous to that class of bodies, would act in the same manner under the influence of potassa. For that purpose, I passed a current of the vapor of camphor over a mixture of potassa and lime fluxed together, then broken into small fragments and heated to about 360° or 400°. The camphor was entirely combined with the potassa, but no gas was disengaged. The mixture was treated with boiling water; the filtered liquor, saturated by an acid, allowed a white, crystalline, acid matter to deposit, which when washed and dried, may be distilled without leaving any residue.

The product thus obtained crystallises very well in alcohol, and especially in a mixture of alcohol and ether. In this state, its consistence is similar to that of camphor. This acid faintly reddens turnsole paper; it perfectly saturates bases. The analysis which I have made of it lead to the formula $C^{40}\,H^{36}\,O^4$. It is that of camphor + 2 equivalents of water. Thus, potassa does not exert on camphor the same action as on the alcohols. Camphor belongs to a peculiar group, in which, doubtless, many bodies which are very analogous to it will be ranked.

Campholic acid, as this new body is termed, presents much interest on account of the circumstances of its production, as well as by reason of the very remarkable transformations which it may be made to undergo. Unfortunately its study has not been developed as well as might have been desired, its preparation being less easy than would at first be supposed. Indeed, it is only with great difficulty that campholic acid could be obtained by acting on the camphor with potassa, under the ordinary pressure. To succeed perfectly, very peculiar circumstances of temperature are required. If we operate, on the contrary, in a corked tube, the reaction which produces the new acid is more easily obtained. By passing and repassing the vapor of camphor several times from one extremity of the tube to the other, over the alkaline mixture pre-

* *Annales de Chimie et de Physique*, Jan., 1841.

viously heated, a considerable portion of matter is attacked, and one might hope to extract 5 or 6 grammes of purified acid, from the contents of one tube. It is very clear that the necessity of conducting the experiment under the powerful pressure which is established in the interior of vessels is a great impediment. It is not always possible to avoid breaking them, and losing the contents.

Campholic acid enters into fusion at 80°C. and towards 250° C. it boils without alteration. It is insoluble in water, to which, nevertheless, it communicates a slight aromatic odor. Alcohol and ether dissolve it in great quantity.

I. 0·300 gr. of campholic acid, obtained by simple precipitation, gave 0·288 water and 0·768 carbonic acid.:

II. 0·300 gr. of the same, but previously sublimed, produced 0·286 water and 0·767 carbonic acid:

III. 0·300 gr. of a new product which had not only been sublimed, but had been crystalized in alcohol, and subsequently melted, yielded 0·290 water and 0·767 carbonic acid.

From these three analyses, the following composition is deduced:—

Carbon	70·83	70·74	70·74
Hydrogen	10·63	10·58	10·73
Oxygen	18·54	18·68	18·53
	100·00	100·00	100·00

Calculated according to the formula $C^{40} H^{32} O^2 + H^4 O^2$, or rather $C^{40} H^{36} O^4$, this composition would become:—

C^{40}	1530·4	71·02
H^{36}	225·0	10·40
O^4	400·0	18·58
	2155·4	100·00

CAMPHOLATE OF SILVER.

Obtained by decomposing the neutral campholate of ammonia by neutral nitrate of silver. This salt is presented under the form of white caseous crystals, very much disposed to enclose the nitrate of silver. To purify it, it must be dried, pulverized and submitted to fresh washings.

I. 0·316 gr. of this salt leave 0·122 of metallic silver, by combustion:

II. 0·735gr. of the same yield 0·412 water and 1·159 of carbonic acid.

Thus is obtained—

Carbon	43·6
Hydrogen	6·2
Silver	38·6
Oxygen	11·6
	100·00

By calculating the composition of this salt according to the formula $C^{40} H^{34} O^3$, AgO, would be obtained

C^{40}	1530·4	43·78
H^{34}	212·5	6·00
Ag	1351·6	38·68
O^4	400·0	11·54
	3494·5	100·00

CAMPHOLATE OF LIME.

This is of a snowy white; crystalline, soluble in water, and much more so in cold than in warm.

It is obtained in a state of purity by treating campholic acid by an excess of ammonia, then adding to the almost boiling liquor, a solution of chloride of calcium.

Campholate of lime is precipitated under the form of a crystalline powder; it is washed with boiling water and dried at 100° C.

I. 0·4 grs. of this salt, prepared with the greatest care, yielded 0·327 water and 0·835 carbonic acid:

II. 1·204 gr. furnished 0.415 sulphate of lime:

Whence—

Carbon	57·7
Hydrogen	9·0
Oxygen	19·1
Lime	14·2
	100·0

By augmenting the carbon to the necessary quantity, according to the supposition that the lime remained entirely in the state of neutral carbonate after combustion, we should have

Carbon	60·75
Hydrogen	9·00
Oxygen	16·05
Lime	14·20
	100·00

The formula $C^{40} H^{36} O^4$, CaO gives

C^{40}	1530·4	60·9
H^{36}	224·6	8·9
O^4	400·0	16·0
CaO	356·0	14·2
	2511·0	100·0

The different results which have just been detailed, authorize the adoption of the formula $C^{40} H^{34} O^3$, H^2 O for the new acid derived from camphor.

We should have indeed:—

$C^{40} H^{34} O^3$, H^2 O . Campholic acid:
$C^{40} H^{34} O^3$, Ca O, H^2 O Campholate of lime:
$C^{40} H^{34} O^3$, Ag O . Campholate of silver.

It was wished to submit these results to a new verification, by determining the density of the vapour of campholic acid. The following are the data of the experiment:—

Excess of weight of the phial	0·517gr.
Volume of the phial	201c.c.
Air left in the phial	0
Temperature of the bath indicated by an air Thermometer	287°
Barometer	0m. 760
Thermometer	14° C.

Hence is deduced—

Weight of a litre of vapor	7·871 grs.
Density	6·058

We have by calculation,

40 vol. vapor of carb.	16·864
36 vol. hydrogen	2·477
4 vol. oxygen	4·410
$\frac{23·751}{4}$	= 5·938 calculated density.

CAMPHOLENE.

The action which anhydrous phosphoric acid exerts on campholic acid, seems to me to merit particular attention. Indeed, anhydrous phosphoric acid does not seem to act here by seizing merely the elements of water,—an action from which would result C^{40} H^{28}, that is to say, camphogen. Experiment does not confirm this.

By distilling campholic acid over anhydrous phosphoric acid, a liquid is obtained, which, purified by another distillation, boils at the fixed temperature of 135° C.

The following are the results of the analysis of this body:—

I. 0·212 grs. yielded 0·248 water, and 0·668 carbonic acid:

II. 0·275 grs. yielded 0·315 water, and 0·868 carbonic acid.

Whence—

	I.	II.
Carbon	87·2	87·3
Hydrogen	12·9	12·7

The matter analysed is evidently a hydrocarbon: as to the atomic relation between the carbon and the hydrogen, it is not sufficiently simple to enable one to resort to clearer analyses. We have indeed—

C^8	306·08	87·5
H^7	43·75	12·5
	349·83	100·0
C^9	344·34	87·4
H^8	50·00	19·6
	394·34	100·0

But the density of the vapor of this liquid shews that the latter proportion is the true one, and leads to the admission of the formula C^{36} H^{12}, for this body.

The following are the details of the experiment:—

Excess of weight of the phial	0·194 grs.
Temperature by the air thermometer	190° C.
Volume of the phial	178 c.c.
Barometer	0m. 753
Thermometer	17° C.
Air left in the phial	43 c.c.

Whence—

Weight of the litre	5·655
Density	4·353

We have, by calculation,—

36 vol. vapor of carbon	15·1776
32 vol. hydrogen	2·2016
$\frac{17·379}{4}$	= 4·344

By comparing this formula with that of campholic acid, we have the equation

$$C^{40}\ H^{36}\ O^4 - H^4\ O^2 - C^4\ O^2 = C^{36}\ H^{32}$$

to account for the formation of the hydrocarbon obtained.

CAMPHOLONE.

In distilling campholate of lime, an oil was collected, which, purified as much as the smallness of the quantity would allow, seemed to be *campholone*.

0·263 grs. yielded 0·275 water, and 0·787 carbonic acid: whence

Carbon	82·8
Hydrogen	11·6
Oxygen	5·6
	100·0

Campholone, C^{38} H^{34} O = C^{40} H^{34} O^3 − C^2 O^2, should contain—

C^{38}	1453·8	82·3
H^{34}	212·5	12·0
O	100·0	5·7
	1766·3	100·0

The composition of camphrone obtained by M. Frémy, is too far from the preceding numbers for these two products ever to be confounded together.

OBSERVATIONS RELATIVE TO THE ATOMIC WEIGHT OF CARBON, AND THE EMPLOYMENT OF SULPHURIC ACID FOR APPRECIATING THE WATER IN ORGANIC ANALYSES.*

BY J. PERSOZ.

By burning 2 gr. 5 of sugar by the sulphate of mercury, taking for a basis the atomic weight of carbon estahlished hy Berzelius, I ought to have ohtained 3 lit. 868 of sulphurous and carhonic acid gases at 0° and 0·76 of pressure: taking for a basis that established hy M. Dumas, I should have obtained 3 lit. 912; whereas, experiment gave 3 lit. 919.

Admitting the accuracy of Liebig's atomic formula of sugar, of which I have made use in these calculations, the experiment which I have just indicated of the comhustion of 2 gr. 5 of sugar, is one more proof, if more be required after the direct and delicate experiments made hy MM. Dumas and Stass, (see *The Chemist*, No. XV., page 65), in favor of the necessity of reducing the atomic weight of carhon. The only thing which remains to be decided, and which is not the least important, is the accurate determination of the equivalent of carbon. Must the numher 75, admitted by MM. Dumas and Stass, be adopted, or must another he sought? It is a question with which I am now occupied, and for the solution of which I have undertaken experiments, which I shall very soon have the honor of laying before the Academy. At present I can announce to it, that in all the combustions made hy means of sulphate of mercury I have collected more carbonic acid than calculation indicated, adopting the number 75 for the atomic weight of carbon. In investigating the cause of the disagreement between my results and those obtained by MM. Dumas and Stass, I could find it only in the perfection which those gentlemen wish to attain in the mode of collecting the water in the combustion of carhon and organic matters. In order to appreciate the slightest traces of carbonic acid or water, MM. Dumas and Stass passed the products of the comhustion through a heap of pumice stone moistened with sulphuric acid. The carhonic acid gas thus deprived of water by its contact with sulphuric acid, is afterwards absorbed by a solution of caustic potassa to be weighed.

Now, as it results from my experiments that at the temperature of + 11° C., and at the pressure of 0m.757, one volume of concentrated sulphuric acid ahsorhs exactly one volume of carbonic acid, it is evident that the employment of sulphuric acid for appreciating water in organic analyses, can lead only to false results.

M. Dumas made the following observations to the Academy on the subject of the ahove communication:—

"It is evident that M. Persoz confirms the necessity of renouncing the old atomic weight of carhon, and that he has ascertained, as well as his processes permitted him, the practical accuracy of the new one. It remains to he known whether in a speculative point of view the round numher 75 must be stopped at, or another, which his experiment does not decide.

"Indeed, in hurning sugar and measuring the volume of the gas which results, M. Persoz is obliged to suppose:—

"1st. That his sugar is pure, and that he has reduced the weight *in vacuo*;

2nd. That his bell-glass is accurately graduated;

"3rd. That the co-efficient of the dilatation of gases is accurately known, and that he can answer for the temperature of his gases to less than a quarter of a degree;

"4th. That Marriotte's law is applicable to carhonic and sulphurous acid gases, contrary to M. Despretz's experiments, and that the pressure to which his gases were submitted is known to less than a third of a millimetre;

"5th. That his gases were absolutely dry;

"6th. That the density of carhonic and sulphurous acid gases is perfectly known; which is not true, at least, so far as regards carhonic acid gas.

"In the midst of all these difficulties, it is surprising that the result which he announces differs only $\frac{1}{800}$ from that which we ohtained in experiments free from any data, by simply weighing the carhon hurned and the carbonic acid obtained.

We cannot admit that the intervention of sulphuric acid could cause any error in our experiments; for if we employed four or five cuhic centim. of sulphuric acid spread over pumice stone, to collect the traces of water which might have resulted from our comhustions of the diamond or anthracite, that acid retained, after the experiment, exactly the same weight as it had hefore.

"The result is easily understood, for if sulphuric acid were, at first, to have dissolved a little carbonic acid, like all other liquids, the oxygen and air which we successively drove through the apparatus could not fail to displace them.

"With the precautions which we have indicated, and which, for other reasons, are indispensahle, the employment of sulphuric

* *Comptes Rendus*; No. 11, March 15, 1841.

acid cannot present any chance of error in the way pointed out by M. Persoz. That learned chemist will without difficulty be convinced, if he will be kind enough to repeat our experiments, or at least some of our analyses."

PHENYLE AND ITS COMPOUNDS.*

BY M. A. LAURENT.

I have discovered, in the oil from lighting gas extracted from coal, a new body which I call *hydrate of phenyle*. It is crystallised, and volatile without decomposition; it acts in some measure the part of an acid. Its properties very greatly resemble those of creosote; they differ only in two or three fundamental reactions.

Its formula may be represented by

$$C^{24}\,H^{10}\,O + H^2\,O.$$

With potassium, it forms, by losing two atoms of hydrogen, a crystallised compound, whose formula is

$$C^{24}\,H^{10}\,O + K\,O.$$

It directly combines with the powerful bases. Its combination with baryta is represented by

$$C^{24}\,H^{10}\,O, H^2\,O + Ba\,O.$$

With sulphuric acid, it forms a combination which I call *sulphophenic acid*. It is a liquid body, forming with bases crystallisable salts. The formula of *sulphophenate of baryta* is

$$(C^{24}\,H^{10}\,O, H^2\,O + S\,O^3) + (BaO, S\,O^3).$$

By distillation it disengages hydrate of phenyle.

Sulphophenate of ammonia, treated by nitric acid, is metamorphosed in a very simple and remarkable manner: sulphuric acid, water, ammonia and carbazotic or picric acid are obtained:—

$$\underbrace{(2\,S\,O^3 + C^{24}\,H^{10}\,O, H^2\,O + H^8\,N^2\,O)}_{\text{sulphophenate of ammonia}} + 3\,N^2\,O^5 = 2\,S\,O^3 + H^8\,N^2\,O + 3\,H\,O^3 + \underbrace{(C^{24}\,H^4\,O\,(N^2\,O^4) + H^2\,O)}_{\text{picric acid.}}$$

Chlorine and hydrate of phenyle form *chloro-phenesic acid*, a liquid compound forming crystallisable salts: its formula is

$$C^{24}\,H^6\,Cl^4\,O + H^2\,O.$$

It is hydrate of phenyle in which four atoms of hydrogen have been substituted by four of chlorine.

By continuing the action of chlorine on the hydrate of phenyle, *chlorophenisic acid* is obtained: it is a crystallised substance, volatile without decomposition, and its formula is represented by

$$C^{24}\,H^4\,Cl^6 + H^2\,O.$$

It is hydrate of phenyle in which six atoms of hydrogen have been replaced by six of chlorine.

Chloro-phenisate of barium .. $= C^{24}\,H^4\,Cl^6\,O + Ba\,O,$

Chloro-phenisate of ammonia $= C^{24}\,H^4\,Cl^6\,O + H^8\,N^2\,O.$

In treating hydrate of phenyle by bromine, *bromophenesic acid* is obtained. It is a crystallised body, similar to chlorophenesic acid, and its formula is

$$C^{24}\,H^4\,B^6\,O + H^2\,O.$$

By treating hydrate of phenyle with nitric acid, a new acid is obtained, which I call *nitro-phenesic acid*. It is yellow and crystallised; it forms with bases salts of great beauty: they are yellow, red, or orange. They detonate with heat. The formula of this acid is—

$$C^{24}\,H^6\,(2\,N^2\,O^4)\,O + H^2\,O.$$

It represents hydrate of phenyle in which two equivalents of hydrogen have been substituted by two of hyponitric acid.

$$(C^{24}\,H^{10}\,O, H^2\,O) + 2\,N^2\,O^5 = [C^{24}\,H^6\,(2\,N^2\,O^4)\,O + H^2\,O] + 2\,H^2\,O.$$

Nitro-phenesic acid is destined to become common in laboratories, and perhaps to receive applications in the arts.

* *Comptes Rendus;* No. 10, March 8, 1841.

Representing anhydrous nitro-phenesic acid by nPe, we have for

Nitro-phenesate of potassa	nPe + K O + Aq.
Dry nitro-phenesate of harium	nPe + Ba O.
Nitro-phenesate of barium dried at 100° C.....	nPe + Ba O + 3 Aq.
Crystallised nitro-phenesate of barium.....	nPe + Ba O + 5 Aq.
Dry hibasic nitro-phenesate of lead.....	nPe + 2 Ph O.
Crystallised hibasic nitro-phenesate of lead....	nPe + 2 Pb O + 4 Aq.
Crystallised sesquihasic nitro-phenesate of lead	2 nPe + 3 Pb O.

By treating hydrate of phenyle with an excess of nitric acid, picric acid is obtained, which I call *nitro-phenisic acid.*

Its formula is—

$$C^{24} H^4 (3 N^2 O^4) O + H^2 O.$$

It represents hydrate of phenyle in which three equivalents of hydrogen have been replaced by three of hyponitric acid.

$$C^{24} H^{10} O, H^2 O + 3 N^2 O^5 = [C^{24} H^4 (3 N^2 O^4) O + H^2 O] + 3 H^2 O.$$

Representing the anhydrous acid hy the symhol nPi we have for the following salts:—

Nitro-phenisate of potassa = nPi + K O.

This composition is the same as that given hy M. Dumas:—

Crystallised nitro-phenisate of silver.....	nPi + Ag O + Aq.
Anhydrous nitro-phenisate of harium	nPi + Ba O.
Dried nitro-phenisate of barium.....	nPi + Ba O + 2 Aq.
Crystallised nitro-phenisate of harium	nPi + Ba O + 6 Aq.
Sesquibasic nitro-phenisate of lead.....	nPi + 3 Pb O + 3 Aq.
Bihasic	nPi + 2 Pb O + 2 Aq.
Quintibasic.....	nPi + 5 Pb O.

ON MINIUM.*

BY M. LEVOL.

Although minium has been made the subject of investigation hy many chemists, there still is a difference of opinion as to the manner in which its true constitution, and even its analysis should he represented. Having had occasion to examine several samples with respect to their commercial value, I was in a situation to make ohservations which have induced me to undertake the work whose results are here given; I do so with confidence, only hecause they appear to me to lend support to the most generally admitted opinion concerning minium, which regards it, not as an oxide distinct from the two oxides of lead, PbO and PbO^2, hut as a combination of these oxides, in an uniform and definite proportion.

The most important scientific work relative to this suhstance is that of M. Dumas, from which it results that this product of the arts always has the composition PbO + 2 PbO, when properly purified, or saturated with oxygen. I have constantly found this proportion in analysing samples of minium obtained under new circumstances, and by two different new processes, which I may here describe.

The first consists in calcining, in a silver or platinum crucible, a mixture of 100 parts of protoxide of lead,—procured hy calcining ceruse,—25 of chlorate of potassa and 200 of saltpetre; the latter salt is used in order to give greater fluidity to the liquid, without needlessly increasing the quantity of the chlorate of potassa.

By operating in this manner, the action of the oxygen on the oxide of lead is so effectual, that it is converted into the puce oxide: this oxide may therefore be prepared with the greatest facility. If we go farther, if the temperature be raised to dark red, the swelling diminishes, the matter thickens, and minium is formed.† To obtain pure minium, with the composition indicated, it is sufficient to hoil on the residue, water containing caustic potassa or or soda, and to well wash it. The product is very finely divided, and of a beautiful, slightly

* *Annales de Chimie et de Physique;* Deuxième Series, tome lxxv.

† The temperature must he raised until it begins to he decomposed in several points, towards the edges, in order to he certain that no puce oxide remains. If it he proposed to prepare the latter oxide, the crucihle must be withdrawn when the matter has acquired an apparently homogeneous black tint, which commonly happens, with the above indicated proportions, when the whole mass is in full fusion: it is easy thus to convert into pure hinoxide, at least nine-tenths of the protoxide of lead employed, hy treating the residue with nitric acid, after having well washed it. Peroxide of lead obtained in this manner is almost black.

orange red, like that of the best minium of commerce.

Minium may also he obtained in the humid way, by boiling, for one or two hours, a solution of an alkaline plumbate, on finely powdered binoxide of lead:* the color of the binoxide gradually becomes brighter, and finally a powder of an ochrey red is obtained. This is minium, generally containing a little puce oxide which has been acted on hy the plumhate; it is easily freed from this hy digesting it, hy means of heat, in oxalic acid, which destroys the puce oxide without attacking the combination, and the oxalate of lead may easily he removed by means of caustic soda or potassa. The product thus obtained always has a deeper red color than that prepared in the dry way, but it becomes brighter and resembles it more, when ground in water; moreover, it has exactly the composition of the first minium, and the difference in the tint seems to he owing only to the texture; indeed, there is some appearance of crystallisation about minium obtained in the humid way.

My analyses were made by leaving the samples of minium for 24 hours in contact with an excess of nitric acid at only 15° B, and without elevating the temperature, for otherwise a portion of the binoxide is decomposed, and a small quantity is dissolved which gives to the liquor a violet color. After this, I had only to weigh the binoxide forming the residue; hut I took no account of its weight until I had ascertained that it was completely soluble in nitrate of protoxide of mercury, which has no action on minium.

The motives which led me to admit as most prohahle the opinion which regards minium as a combination of the oxides of lead, are as follows:—

Admitting that minium is a peculiar oxide, intermediate between these two oxides, an inexplicable thing, the protoxide of lead being calcined with chlorate of potassa, is readily peroxidised; hut we cannot, in the same manner, as I have ascertained, convert minium into the puce oxide.

Oxalic acid makes the puce oxide immediately pass to the state of the protoxide, hut does not alter minium; which is, at the same time, a means of purification, and a good characteristic of minium. From the fact that this acid, as well as the nitrate of mercury and sulphurous acid, removes the hinoxide in the state of protoxide and has no action on the minium, it may again, in my opinion, he inferred, not only that minium is a combination of the two oxides, but that this combination is possessed of remarkable stability.

* Pure plumbate may be used, but it is more convenient to employ a liquor obtained hy dissolving in water five or six parts of crystallised nitrate of lead to one part of hinoxide, to which is added sufficient caustic soda or potassa to redissolve the hydrate of lead.

ON ALBUMEN, FIBRIN, THE WHITE MATTER OF THE GLOBULES OF THE BLOOD, AND CASËIN.*

LETTER FROM DR. JUSTUS LIEBIG TO M. PROSPER DENIS.

At length I have the satisfaction of announcing to you that all your experiments on fibrin and albumen, with respect to their identity and composition, have been found very accurate. We entirely dissolved pure fibrin in a saturated solution of nitre, keeping them together both at a temperature of from 50 to 56° C. The fibrin at first became gelatiniform, and left only a few gelatinous flakes. The filtered liquid possessed all the properties of alhumen. We succeeded without employing caustic alkali, which at first appeared to me indispensahle and decisive. We have also remarked that boiled fibrin does not dissolve. The composition of dissolved fibrin (changed into liquid albumen) was exactly the same as of ordiuary fibrin and albumen. The formula

$$C^{48}\ H^{74}\ N^{14}\ O^{11}$$

expresses the relative proportion of its elements.

We have likewise succeeded in precipitating albumen under the form of globules, hy adding a sufficient quantity of water to serum rendered neutral hy an acid; and we were enabled to extract the fibrin from the globules of the blood, hy the process which we have indicated.

By adding to albumen a little caustic potassa, it was precipitated under the form, and with the properties, of casëin, hy means of alcohol.

I am happy, Sir, to have been able to contribute a little to put your important discoveries beyond doubt. I am preparing a Memoir in which I shall detail the analyses undertaken with this view.

† *Comptes Rendus de l'Academie des Sciences*, No. 12, Paris, 22 Mars, 1841.

Composition of Fibrin, rendered soluble according to the Method proposed by M. Prosper Denis, and precipitated from its Nitrous Solution by cold Alcohol, and treated by boiling Alcohol and Ether.

	1st Analysis.	2d Analysis.	3d Analysis.	
Carbon . . .	54·508	55·002	54·511	Incombustible matter, or ashes, 1·351 per cent.
Hydrogen . .	6·874	7·280	6·974	
Nitrogen . .	18·032	18·197	18·037	Proportion of carbon to nitrogen :: 7 : 1.
Oxygen . . .	20·586	19·521	20·478	

Fibrin of the Blood directly treated by Water, cold Alcohol, and boiling Alcohol and Ether, without previous Solution.

Carbon	54·988	C : N=7 : 1.
Hydrogen . . .	6·876	
Nitrogen . . .	18·190	
Oxygen . . .	19·946	

Albumen prepared by dissolving in water, Serum dried in the open Air, at the ordinary Temperature, by afterwards precipitating it by cold Alcohol, and by purifying it by boiling Ether.

	1st Analysis.	2d Analysis.	
Carbon .	54·726	54·765	C : N=7 : 1.
Hydrogen .	7·312	7·065	
Nitrogen .	18·105	18·118	
Oxygen .	19·857	20·052	

Serum of the Blood treated, without previous Solution, by cold Alcohol and boiling Ether.

Carbon . . .	55·233	C : N=7 : 1.
Hydrogen . . .	7·156	
Nitrogen . . .	18·275	
Oxygen . . .	19·336	

All these analyses were made in the laboratory of Giessen, by Dr. Scheerer. I have taken every precaution to ensure accuracy.

ON THE FORMATION OF LAMPIC ACID.*

BY R. F. MARCHAND.

Lampic acid, which consists, according to the investigations of MM. Stass and Martens, of acetic, formic, and aldehydic acids, but in proportions varying according to the temperature of the helix of platinum, may be obtained in the state of a mixture in uniform proportions in making Leidenfrost's experiment with alcohol or ether.

When alcohol or ether is poured, drop by drop, into a heated platinum capsule, the liquid runs round and is agitated on the metallic surface without being sensibly evaporated, and, besides, presenting the appearances already described in analogous phenomena. The products may easily be collected by covering the capsule with a tubulated retort with the bottom detached: from time to time a fresh quantity of liquid is poured in. Thus may be procured, in a short time, a considerable quantity of distilled liquor: this, as may easily be proved, is no longer alcohol: it possesses all the properties of lampic acid. The relative proportion of the mixed elements of this acid depends on the temperature to which the platinum capsule is brought. The author has proved that the same result may be obtained by substituting for the platinum capsule, polished copper or iron ones: it is important that the metallic surface should present no asperities, otherwise Leidenfrost's experiment does not succeed; thus these effects stop when sand or pounded glass is spread over the metallic surfaces. The temperature at which the phenomena commence is about 60° C.

The author regards the explanation which Buff has given of these phenomena (*Poggendorff's Annales*, Vol. xxi. p. 591) as perfectly satisfactory.

* *Annales de Chimie et de Physique.* Deuxième Series, tome lxxiv.

NEW INVESTIGATIONS CONCERNING INDIGO.*

BY M. A. LAURENT.

I have the honour of communicating to the Academy the extract of a work which I have undertaken relative to indigo, and for which I now desire to take date, the great number of new combinations which I have obtained not allowing me to foresee at what time this work will be completed.

The composition of indigo has been determined by M. Dumas, who represents it by the formula

$$C^{32}\ H^{10}\ O^{2}\ N^{2}.$$

According to Erdmann, indigo contains less oxygen: his formula would be

$$C^{64}\ H^{20}\ O^{3}\ N^{4}.$$

Adopting the new atomic weight of carbon given by MM. Dumas and Stass, these formulæ cannot agree with the results of experiment; they present a hundredth too much of carbon.

I have analysed perfectly pure sublimed indigo, by the new methods of analysis, and I found that its composition might be exactly represented by the formulæ to which M. Dumas was led by adopting the old atomic weight of carbon.

By oxidising indigo, I discovered a new substance crystallised in large red prisms, similar to those of the red ferro-cyanuret of potassium. I call it *isatine:* its composition is represented by

$$C^{32}\ H^{10}\ N^{2}\ O^{4},$$

that is to say, indigo plus two atoms of oxygen. This formula, as is evident, does not agree with the theory of substitutions, for it must in that case be thus represented:

$$C^{32}\ H^{8}\ N^{2}\ O^{3} + H^{2}\ O:$$

but this body does not contain water; on the contrary, it absorbs one atom under the influence of bases, forming a new acid which I call *isatic acid,* the formula of which, in the salts, is represented by

$$C^{32}\ H^{12}\ N^{2}\ O^{5}.$$

Isatine and ammonia give rise to several compounds, and among others to a new acid which may be regarded as a compound of $1\frac{1}{2}$ atoms of isatine with 1 atom of water—

$$C^{48}\ H^{17}\ N^{3}\ O^{7}.$$

Isatine and chlorine form two remarkable compounds discovered by Erdmann, by making chlorine act on indigo, under the influence of water—*chlorisatine* and *bichlorisatine.*

According to Erdmann, the formula of the first would be

$$C^{32}\ H^{8}\ N^{2}\ O^{3}\ Cl^{2},$$

and that of the second,

$$C^{32}\ H^{8}\ N^{2}\ O^{3}\ Cl^{4}.$$

According to my analyses, chlorisatine would be represented by

$$C^{32}\ H^{8}\ N^{2}\ O^{4}\ Cl^{2}$$

and bichlorisatine by

$$C^{32}\ H^{6}\ N^{2}\ O^{4}\ Cl^{4}.$$

Bromine and isatine yielded me the same compounds as those discovered by Erdmann by the action of bromine on indigo.

According to him, bibromisatine would be represented by the formula

$$C^{32}\ H^{8}\ N^{2}\ O^{3}\ B^{4},$$

and according to my analyses there would be two atoms less hydrogen.

Finally, I have long since announced that, in general, bodies obtained by equivalent substitution should be isomorphous. M. De la Provostaye has given us the first example in support of this idea, in making known the isomorphism of oxamethane and chloroxamethane. I found that chlorisatine and bichlorisatine had exactly the same angles. These are good examples, but they are not the only ones: I will give others in my next Memoir.

* *Comptes Rendus,* No. 12; March 22, 1841.

PROCESS FOR OBTAINING POTASSIUM.*

BY ROBERT HARE, M.D.

In evolving potassium, agreeably to Brunner's plan, I have substituted for the luting usually employed to protect the iron bottle, a cylinder of iron, which is made to surround the iron bottle; also a disk of the same metal of a diameter and thickness equal to that of the cylinder.

The disk is supported by bricks of kaolin. The bottle being vertical, the blast acts more equably on the surface of the iron, and the operator can, by additional fuel, protect any part from that undue exposure to which the under surface is always liable, when the bottle is horizontal.

The potassium is received into an iron tube, of which the bore is two inches in diameter. This tube screws at one end into the small bottle, and at the other is closed by a perforated plug, terminating in a small orifice. To this a leaden tube is fitted, which is so adjusted by bending, as to cause the vapour resulting from the burning of the gas, to go into the ash-hole. By these means the hydrogen, being ignited as soon as it comes over, serves as an index of the success and progress of the process. In this way, no resort to naphtha is in the first instance necessary. The potassium is extricated from the tube by cooling it by infusion of water, detaching it from the bottle, and then closing the end thus exposed by a cap, in which a suitable conical female screw is wrought.

The part of the tube containing the potas-

* From *Silliman's Journal.*

sium is then made in a vertical position to occupy the axis of a cylindrical furnace, the end terminating, as above mentioned, in a tapering plug, being lowermost, and projecting below the bottom of the furnace. Before the temperature reaches redness, globules of the metal begin to descend; but to extricate the last portion a white heat is requisite. The potassium may be received in bottles, kept full of hydrogen by a constant current, or in naphtha. The first portion, which descends before the temperature is high, can be more easily received without naphtha than the latter portion.

II. CHEMICAL MANUFACTURES.

APPLICATION OF THE DAGUERREOTYPE TO THE TAKING OF LIKENESSES FROM THE LIFE.*

BY J. F. GODDARD, ESQ.

Mr. Goddard, who is engaged by the patentees to work the process, delivered a lecture at the Royal Institution on the above subject, on the 26th of March; it is accomplished by Wolcott's reflecting apparatus, and is secured by patent. It is hardly two years since it was first announced in Paris that M. Daguerre had made a most wonderful discovery, by means of which he was enabled to fix the images and pictures obtained in the camera obscura, and thus, by the action of light, produce designs in which the objects preserve their forms with the strictest mathematical precision, even to the most minute details.

The extraordinary interest and curiosity which this announcement created, not only in Paris, but throughout Europe, and in England more particularly, is generally known. Nor was this curiosity and interest in the least diminished or disappointed when the secret of the process was made known. For such was the extraordinary accuracy with which every object in nature was copied—the perspective represented—the most delicate gradations of line and shadow brought out; the faithfulness of the representations as a whole; to say nothing of the singular novelty of the process by which these beautiful effects were produced, that it became the all-absorbing subject of attention at the time.

The vast importance of this discovery in the arts and sciences was evident, and the resources and facilities that it would afford in their study were incalculable, so much so, that a bill for rewarding its authors, MM. Daguerre and Niepçe, was proposed by Louis Philippe, and adopted by a special commission charged with its examination, on condition that the secret was published for the benefit of the *whole world*. But, strange as it may appear, it is a fact recorded by Daguerre himself, that whilst M. Duchâtel, the Minister of the Interior, was urging upon the Chamber of Deputies as reasons why this extraordinary and liberal measure should be adopted by them, that "unfortunately for the authors of this beautiful discovery, it was impossible for them to bring their labour into the market, and thus indemnify themselves for the sacrifices incurred, *as the invention did not admit of being secured by patent.*"

At this very time, Niepçe, after obtaining Daguerre's sanction, which was done only with very considerable delay, was actually contradicting this statement of the Minister by commissioning an agent in London to take out a patent for this country. The consequences of which have probably not been very satisfactory, as it necessarily put at once a check to anything like speculation here; but not so in other countries. To America is due the honour of having first successfully applied the discovery to the taking of portraits from the life. The apparatus by which this is effected has been patented in this country by Mr. Beard, a gentleman who has spared no expense in bringing it to perfection; but the invention being a communication from a foreigner residing abroad, viz. Mr. Wolcott, of New York, and consisting in very important improvements in Daguerre's process, it is proposed to substitute a name better suited to the principles of English nomenclature, than that of Daguerreotype, which, although a favourite word on the Continent, is by no means suited to our views, and has no reference whatever to the principles of the subject; the patentees have therefore adopted the term *Photography*, which signifies that the pictures are produced by the action of light.

The various means that have hitherto been adopted, and the more recent improvements enumerated, were the principal points entered on by the lecturer in treating the subject, the details of which were the following:—

* As given in the *Inventors' Advocate*, No. 88. In this excellent periodical will be found reports of the meetings of all the Metropolitan scientific bodies. It is one of the most ably conducted weekly scientific journals of the day.

Images of objects may be obtained in two ways: hy refraction through a lens, and by reflection from a mirror. Mr. Goddard then proceeded to describe the camera as originally constructed by Daguerre, and also the minutiæ requisite to be attended to, in preparing the plates, on which the image is to be reflected. The plates used are made of copper, silvered on one side only, the purer the silver the hetter — as the effect depends to a very great extent on the perfection of the polish and the uniformity of their surfaces. To prepare the plates for the camera (after the polishiug has been effected) they are gently washed over with dilute nitric acid, the proportion as suggested hy Daguerre answering the purpose, viz. one part of acid to 16 parts of water; this solution is gently and uniformly applied to the polished surface by means of a piece of cotton moistened with it;—the plate is afterwards wiped quite dry hy using several pieces of dry cottou; finely divided pounce (sifted from a linen bag) is distributed over the surface, and ruhhed also with cotton: this process Daguerre recommends to be performed three or four times. This completed, the plate is exposed to the vapour of iodine, in a box for the purpose; in a short time the surface becomes coated with a pale yellow or golden tinge, and is then fit for the camera. The operator then removes it in the dark, and introduces it hy means of an apparatus into the place previously occupied by a plate of ground glass, on which the reflection had been properly adjusted according to focus. After it has remained in the camera for a given time, depending on the power of the light, it is removed and exposed to the vapour of mercury (heated to ahout 690 degrees Fahr.) in the mercurial box. From this it is placed in a trough, and the surface covered or washed with a hot and weak solution of the hyposulphite of soda, which permanently fixes the object. All that which we have just described must he performed in the dark, and constitutes the process originally made use of by Daguerre and Niepçe. It is not altogether applicahle for taking portraits from the life.

It is to Mr. Wolcott, an optician of New York, that the world is indebted for the working out of the idea of taking portraits from the life; who, having speculums on hand, was led to experiment with them on a plaster hust, and he succeeded beyond all expectation on the first trial, the plate having heen exposed in the instrument only five minutes; the diameter of the speculum first used was about seven inches.

To procure the silver plates then became a matter of some little difficulty, after all those of French manufacture had heen used. Mr. Johnson adopted a method by which he ohtained good surfaces; and this he accomplished hy plating, to some thickness, silver on copper, and polishing the surfaces of two pieces as high as it was possible. He then applied the *two* polished silver surfaces together, and had them passed hetween the rollers of the rolling mill; after the pieces had heen reduced to the proper degree of thickness, the surfaces of hoth the plates were found to possess a polish far superior to that ohtained in the usual way. Mr. Goddard considers that the plates manufactured at Birmingham, under the superintendance of Mr. Johnson, are equal to those procured from Paris.

The process now adopted to finish plates so prepared, is to use, instead of pounce, finely divided tripoli, after the dilute nitric acid; this ought to be done just before it is used, otherwise, if prepared long before, the air appears to have some peculiar effect on the surface, the rationale of which is not altogether understood. Finely divided *rouge* and *charcoal* applied on *black velvet* are the materials used to finish up the polish, which gives it a dark hue; so much of the effect of the picture depending on the depth of shade produced.

A bust was then taken by the oxy-hydrogen light in the space of three minutes. The time formerly required by the old process was about five or six minutes in the middle of the day; hut with the more recent improvement of Mr. Goddard (we believe the *iodide of bromine*) he is enabled to take likenesses in the space of from two or three seconds, to one and a half, or two minutes.

So many effects are produced of a varied character, hy the mode thus adopted in preparing the plates, and almost every result may he ohtained that the artist may desire, some of them resemhling even the style of Rembrandt, &c. &c.

As it is necessary that the individual to he taken should sit in as strong a light as possible, it has been found expedient to glaze the sky-light in front of which he sits, with deep blue glass; by this arrangement the light is moderated to a considerahle degree, enabling those of weak sight to hear it without inconvenience; and the blue glass also performs a part of some importance in the process, hy transmitting the *chemical* rays, and obstructing to a certain extent the *luminous* rays.

In conclusion he considered that the invention as now practised would prove serviceahle to artists, and especially miniature painters, as it would enahle them to flatter their patrons, at the same time retaining the character so as to give a correct likeness.

ON THE PRESERVATION OF MEAT FOR FOOD.

BY M. GANNAL.

The following is a translation of an abstract of a memoir read before the Royal Academy of Sciences, Paris, by M. Gannal, inventor of the well-known process of embalming, as given in the *Compte Rendu* of March 22. The author commenced by recapitulating some of the inconveniences presented by the most commonly employed processes for preserving meat; he remarked that, whatever substance be employed, great advantages result from its being introduced by injection, instead of making it slowly penetrate, as in the ordinary process of salting, by imbibition from within or without.

"By injection will be obtained, besides the saving of time and money, an uniform distribution of the preservative substance, while by maceration, especially if large pieces be acted on, the portions nearest to the outside, become super-saturated with that substance, before the internal parts have received sufficient to prevent their decomposition."

Then, devoting himself to the examination of the substances which might be used instead of common salt, M. Gannal referred to the soluble salts of alum, substances which have the power of preventing the putrid fermentation of animal matter, but some of which communicate to it an unpleasant taste, or injurious properties. According to him, none of these inconveniences exist in the chloride of aluminum.

"I was," said he, "theoretically convinced that flesh preserved by this salt in a state of purity, should acquire no taste, because, in the first place, the quantity used is very small, and besides, from the reaction which is operated, there results only a small quantity of chloride of potassium, sodium, or calcium — salts which are daily employed in our households, in the grey salt consumed in our kitchens. As for the portion of alumina introduced into and combined with the animal matter, it is met with in such small quantities that it need not be stopped.

"Alum is employed in medicine, and acts as an astringent; but in this case the argillaceous earth is combined with an acid, while in meat it is nothing more than an earthy powder, without action on the animal economy. On this subject, it may be affirmed that the inhabitants of the borders of the Seine, who drink the water of that river at least half the year, daily drink ten times more aluminous earth than they would take by habitually eating meat prepared by my process.

"Experiments on the degree of concentration to be given to my liquid to effect the preservation of meat, without uselessly adding too large a quantity of salt, have shown me that the suitable solution should mark 10° of Baume's Areometer. Now one kilogramme of this salt, as prepared by M. Guerin, is sufficient for six quarts of water; from nine to twelve quarts of this liquid are required for the preservation of an ox, that is to say, from one kilogramme and a half to two kilogrammes are employed.

"The *modus operandi* is very simple. When the animal is felled by a blow on the forehead, the carotid and the jugular are opened on one side, by making an incision from the larynx to those two vessels; then, by a brisk movement, the cutting instrument is raised, which divides all the parts, and allows the whole of the blood to run out.

"When the blood ceases to flow, a syphon is introduced into the carotid, a ligature is made at the superior part to prevent the liquid from running out, both the apertures of the jugular are tied, and the injection is then introduced.

"The most suitable instrument for this operation is a tube of waterproof linen, of two metres in length, three centimetres in diameter at the bottom, and five or six centimetres at the top; this tube must be fixed to the syphon, which should be of wood or horn.

"As soon as it is perceived that the animal is well injected, that is to say, when no more liquid goes in, and when the subcutaneous veins are well swelled, the tube must be squeezed between the finger and thumb, which must be made to descend with pressure for the length of the column; by this means the quantity of the liquid is increased in the interior of the animal. A ligature is made below the syphon, which is then withdrawn; twenty minutes afterwards the animal is skinned, then emptied, and, finally, cut up in the ordinary way; there is no necessity for removing the bones and fat, as in the process of salting.

"When the animal has been well bled, and the injection well performed, it is scarcely perceptible that the animal has undergone any preparation at all. The only part where the injection leaves traces is in the lungs, which are dried up and discolored.

"When the animal is cut up and hung in the air, the flesh is left in this state until it is cold; the only precaution to be taken is to prevent the flies from getting at it.

"Meat which it is wished to preserve for a certain time, requires no other preparation: it is sufficient to hang it in a dry and airy place. When it is intended to preserve it more than fifteen days, the flesh must be washed in a solution at ten degrees of chlo-

ride of sodium, and an equal quantity of chloride of aluminum. When this is done, the meat is applied to the purposes for which it is intended. That which is to be dried, must be hung in a chamber heated by means of a current of hot air, or air charged with wood smoke, or even in the open air; but in this case, flies must be guarded against.

"When this meat is dried, it is sufficient to pack it in barrels hermetically sealed, and to keep the latter in a dry place.

"To use this meat, all that is required is to macerate it for four-and-twenty hours, and as it is not salted, the swelling may easily be effected in sea water.

"When it is wished to preserve fresh meat, it is piled up in barrels, as is done in the common method of salting; when the cask is full it is closed up; then it is filled with either a saturated solution of chloride of sodium, with the washing mixture, or simply with dry chloride of sodium. The three means have given good results.

"This bath contributes but little to the preservation, but it prevents the vegetation of *bissus:* without this precaution, the meat would become musty.

"Among the experiments which I made, a barrel was opened after three months, and a leg of mutton was taken out which was roasted and eaten, and pronounced very good by twelve persons; but the barrels having been badly closed the liquid of the bath was lost, and the meat was covered with mould, but was not decomposed."

A committee, consisting of MM. Thenard, Magendie, Dumas and Séguier, has been appointed by the Academy to investigate the merits of this process, and to report thereon.

METHOD OF OBTAINING STEEL OF DIFFERENT COMPOSITIONS AND QUALITIES.*

BY COLONEL ANASOF.

In a memoir on the manufacture of cast steel at St. Zlataoust, the imperial manufactory of swords and of iron, situated in the southern part of the Oural mountains, Colonel Anasof describes the processes adopted in that manufactory to produce the steel in earthen crucibles by the fusion of bars of iron and steel by means of blast furnaces. The peculiarity of this process consists in this; that iron is put into the crucibles covered with charcoal to submit it to a kind of cementation, whilst in England steel previously cemented is employed. In other respects there is nothing new in the method adopted, but it may be serviceable to state, briefly, the means indicated by the author of the memoir of obtaining steel of different varieties in its composition and qualities. The following are his observations on this point:—

"The processes adopted for the fabrication of steel are sufficient to show the principal causes which tend to vary the qualities of this metal; as, for example, the quantity of carbon absorbed by the iron and the nature of the iron itself. As the first of these causes may be regulated at will, it requires no explanation, and the second need not now be considered. I will therefore confine myself to the rules that I have formed, which are the results of a great number of experiments.

"1st. The purer the iron, that is, the more free it is from other substances, the better will be the steel procured from it; but the cementation will require longer time.

"2d. All qualities of soft iron are not to be preferred to brittle iron; for if the hardness of the latter be caused by the carbon it contains, it is preferable to soft iron, of the same qualities in other respects.

"3d. The aptitude of the iron to be converted into steel, depends more on the quality of the iron ores even than on the preparation of the iron. For instance, the iron procured at Zlataoust, from the ore extracted from the Tesminck mine, is preferred to that of all the other mines in that neighbourhood; and the iron from the iron works of Tagilsk produces steel of a superior quality to that from Zlataoust.

"4th. The steel clippings from the swords made with cemented steel produce cast steel of a quality little superior to that of the clippings of iron.

"5th. The bars of iron which have been buried under ground for some time, produce steel of a quality superior to that obtained from iron which has been recently manufactured. This fact was known in Asia in the most ancient times, but Europeans having forgotten the lessons of their masters in metallurgy, have been in arrear of those nations, not only in the art of making the best steel, but also in the knowledge of the signs by which the perfect article can be positively ascertained. If we are well informed, one English cutler at least, Mr. Weiss, has satisfied himself of the superiority for making steel of iron which has remained a long time under water.

"6th. The clippings of pieces of iron which have been a long time exposed to the air, produce worse steel than fresh iron.

"7th. The steel is of better quality when the pieces of iron are homogeneous and of equal size.

"8th. The steel is softer when the open-

* *Moniteur Industriel*, and *Inventors' Advocate*, No. 90.

ing in the crucible for the proof is small, provided that the pressure of the iron be equal up to the time the lid is put on the crucible.

"9th. If the workman have neglected to put the lid on in time, he may render the steel of good quality by adding as much iron as is necessary to raise the metal to the proper height.

"10th. If at the time of the final proof the steel does not send forth sparks sufficiently bright, the evil indicated by this bad sign may be remedied by introducing through the opening of the crucible two or three pieces of iron of the weight of about half a kilogramme.

"11th. The fusion of the steel mixed with powdered charcoal or soot in determined proportions, and in a closed crucible, as proposed by Messrs. Mushet and Bréan, might, indeed, produce steel, but its degree of hardness would be much less certain than on the plan I have described. In fact, if the charcoal be in excess the steel will become too hard; if there be not enough, the metal will be difficult to fuse, because a part of the charcoal will be volatilised.

"12th. The addition of other metals, such as platinum, silver, or gold, in the proportions of 15 to 12 per cent., somewhat improves the quality of the steel, but the more pure the steel is, the less advantageous do such additions become. The effect of the addition of these metals consists principally in making the steel more easily forged, the proportions of carbon and iron being equal.

"As to brittle metals, their mixture with steel is always more or less injurious, and this becomes more apparent in proportion as the quantity of the alloy is increased."

PROCESS FOR EXTRACTING THE ORE IN LEAD MINES CONTAINING GOLD AND SILVER.*

BY M. BECQUEREL.

The beautiful experiments of M. Becquerel, on the adaptation of electro-chemical† action to effect the separation of lead and silver in galena containing gold and silver, have shown the possibility of applying electricity in the management of these mines. This valuable discovery has indeed been already adopted on a large scale by M. Becquerel, in the experimental manufactory that he has established in Paris; but, as is often the case in inventions of great importance, many years will probably elapse before his system is universally adopted in the working of lead mines containing silver. M. Becquerel observes, in reference to the method of extracting the metal at present pursued:

As a proprietor of the auriferous and argentiferous lead mines in the Duchy of Baden, I have carefully attended to the various processes that are generally adopted, and I am convinced of the possibility of obtaining a much greater produce from the mines by improving this process.

The observations that I have made, may be of some use to the lessees or proprietors of lead mines containing silver or gold. I will mention them in succession, pursuing in detail the method of working in the mines that I have superintended for ten years. Many of these mines are very rich in silver and gold.

First, as the manner of washing the ore. By the manner in which the process is now executed, it is evident that a considerable quantity of the ore is lost, and the portion lost is that which is of the greatest value—the sulphuret of silver.

The gold and silver galenas in general, have for their matrix a very hard quartz, in which are irregularly embedded sulphurets of silver, lead, iron, sulphate of barytes, or carbonate of iron, and also fluor spar. The variety of sulphurets that I have just enumerated contain gold, but in such a state of tenuity, that it is invisible by the microscope, and eludes every attempt to analyse it; yet gold does exist, since it is found in considerable quantity in assaying the silver. The ore broken into pieces of from two to five centimetres, falls by degrees into the trough in which the stampers work. A current of water passes through this trough, which is closed in front by a very close iron grating. The treading of the stampers must be continued for a long time to reduce the ore sufficiently small to admit of its passing through the grating, and being carried into long canals called labyrinths, where it is deposited at a distance further or nearer in proportion to its size.

In attentively examining what takes place during the process of washing, it is remarked that the fragments of ore, owing to the great hardness of the matrix resist the treading of the stampers for a considerable length of time, and that they only very gradually diminish in size till they are completely broken. The ore thus successively reduced into minute pieces, is gradually carried away by the current of water beyond the labyrinth, where it ought to be deposited; and the loss of this part of the ore is more to be regretted, as the sulphuret of silver being very friable, it is the sulphuret that is first carried away; none remains but what is contained in those pieces of the ore, which from their size and weight have had power to resist the influence of the current.

I am well assured that the loss which I have just stated, is but too certain, as at the

* *Moniteur Industriel; and Inventors' Advocate, No.* 89.

† *See The Chemist, No. IX.*

extremity of a labyrinth which reached for 200 metres, I took up water that was impregnated with the deposits of ore. This sediment, on being put to the test, yielded in the same weights a proportion of silver equal to that of the sediment in the water at the entrance of the labyrinth. The particles of gold disseminated in the sulphurets of lead, iron, and silver, not in a state of combination, but only united mechanically, escape in the same way.

Many ingenious men have in their writings indicated as a method of collecting the gold contained in minerals and in auriferous sands, the levigation of these very finely comminuted substances; but I cannot suppose that in this manner they imagine it possible to obtain the whole of the gold; this could only be done by means of chemical analysis. A very simple experiment will suffice to prove how very inefficient levigation is for this purpose.

Take two discs formed of an alloy composed of lead, silver, and gold, and give them a circular motion against the surfaces of each other, by keeping them immersed in a vessel full of water. The water will very soon be rendered turbid and cloudy. If in the same water two discs of the mineral in which the ores are embedded (quartz for instance) are afterwards rubbed against each other, long enough to add new particles to those already contained in the fluid, all the metallic and earthly particles will not be settled till after eight days, and no trace will be perceived on the outer surface of the glass vase that the particles have been deposited according to their specific gravities. They will appear all mingled. Hence it may be concluded that when metals, ores, minerals, and sands, in a state of extreme division are mixed, levigation is an ineffectual means of producing their complete separation.

The next operation to be considered is that of smelting the ores. The products of the mines are also greatly diminished at present by the loss of lead, silver, and gold, in the operation of smelting, in either reverberating or other furnaces generally used.

In the former case the roasting of the slag is a long and difficult operation, and with many ores almost impossible; those of Baden for instance, of which the matrix composed of quartz, of sulphate of barytes, and of fluor spar, is fusible to such a degree, that in making use of the reverberating furnace it would be necessary to smelt without previously roasting, and to let the first melting run out, which it would be necessary afterwards to calcine before resmelting in another furnace, which must also be resorted to, to extract part of the refractory scoriæ. The losses in smelting are occasioned—

1st. By the volatilisation of a great quantity of sulphuret of lead and sulphuret of silver, before their reduction.

2d. By the action of the fluxes, and particularly the silex on the lead at its different degrees of oxydation, from whence is produced the silicurets of lead which unite with the scoriæ.

3d. By the alkaline sulphurets and persulphurets, which, in a great degree absorb the gold contained in the ore to be smelted.

4th. By the great quantity of fuel necessary to be used to retain in a state of constant fluidity the enormous proportion of the scoriæ of forges and furnaces obliged to be added to the melted ore, in order to secure the metal from being reduced by oxydation and volatilisation during the time it is passing into and remaining in the furnace, where I believe the temperature is raised to a much higher degree than is necessary.

5th. Finally, because, instead of obtaining by one smelting in which there is so great a consumption of combustible, the whole of the lead contained in the ore, only half of it is at first extracted, and the other half must be afterwards calcined, which is only an impure metal or sulphuret, in order to be smelted again.

I make no observation on the manner in which the operation of cupelling it is done at Baden, because I believe it is impossible to be managed better.

The consequence of the inconveniences that I have enumerated is, that though the produce arising from the gold and silver lead mine is quite equal to what might be expected in their present condition, it is yet capable of being considerably increased by improving the method of washing and smelting. I am in possession of the certain method of effecting this, whith I shall allude to in another paper.—*Moniteur Industriel.*

III. PHARMACY, &c.

REPORT OF THE COMMITTEE APPOINTED AT A PUBLIC MEETING OF CHEMISTS AND DRUGGISTS, HELD AT THE CROWN AND ANCHOR TAVERN, STRAND, ON THE 15th OF FEBRUARY LAST.

Your Committee, immediately upon their appointment, opened a communication with the Chemists and Druggists of every town in England, and of some towns in Ireland and Scotland, requesting the co-operation of the members of the trade, and soliciting subscriptions to enable them to offer the most powerful and effectual opposition to

Mr. Hawes's Bill; and your Committee had the satisfaction of receiving, not only promises of support, but liberal subscriptions from many places.

Agreeably with the instructions of the General Meeting, your Committee proceeded to the appointment of a deputation, for the purpose of conferring with Mr. Hawes, on the subject of postponing the Second Reading of his Bill; to which request Mr. Hawes readily acceded, and also undertook to erase from the said Bill every clause having special reference to the Chemists and Druggists.

Upon the introduction of Mr. Hawes's second Bill, your Committee, acting under the advice of their Counsel and Solicitor, determined to offer it their most powerful opposition, as the provisions of the latter Bill had an injurious power over the interests of the Chemists and Druggists equal with that of the former.

Your Committee, through their Solicitor, thereupon required of Mr. Hawes that he should insert a protective and explanatory clause, which should render the Bill totally inoperative upon the interests of Chemists and Druggists. To this Mr. Hawes has assented; and should the Bill pass a Second Reading the said clause will be duly inserted.

Your Committee, however, are bound by parliamentary usage to offer an opposition to the Second Reading of the Bill, and they have caused a Petition to be presented to the House of Commons against the measure.

They have also sent a copy of the same to almost every town in England, requiring the members of the trade, in the various localities, to forward a Petition, on their own parts, against the Bill, and to instruct their representatives in the same opposition. Your Committee had the satisfaction of finding that, upon a Second Reading of the Bill being attempted, a large number of Petitions were presented against it, and the House was "counted out." Your Committee, though warranted in expressing an opinion that this Bill will not pass, are yet aware of the undiminished necessity of watching any further attempts to accomplish that object.

In the progress of their proceedings, your Committee ascertained that the College of Physicians, the College of Surgeons, and the Apothecaries' Company had conjointly proposed obtaining some legislative enactment, by which the Chemists and Druggists were to be, for the future, placed under the government and control of these learned bodies, more especially of the Society of Apothecaries.

A Deputation from your Committee, therefore, sought and obtained an interview with the College of Physicians and the College of Surgeons, respectively, and received from the former an official notification that it was their intention to introduce into their proposed measures of medical reform, a provision by which the Chemists and Druggists should thenceforth be placed under some legislative control; and your Committee have, therefore, again assembled you for the purpose of receiving new instructions and enlarged powers to meet present and future circumstances.

Your Committee having considered the subject, are of opinion that the Chemists and Druggists are capable of self-government; they, therefore, recommend that the Chemists and Druggists of the Empire should immediately form themselves into a permanent Association, to be denominated the "Pharmaceutical Society of Great Britain," having for its object the union of the members of the trade into one body—the protection of the general interests—and the improvement and advancement of scientific knowledge. As the basis of such union, your Committee would recommend the adoption of Education, Examination, Registration, and Representation as involving beneficial results to the Public in general, and to the Chemists and Druggists in particular; and offering to the existing medical corporations, and to the medical profession at large, a guarantee, that whilst the Chemists and Druggists are anxious to retain their present privileges, they are disposed to afford every public evidence of their fitness to exercise them.

Joseph Gifford, Chairman.

At a Public Meeting of the Members of the Trade, held at the Crown and Anchor Tavern, in the Strand, on Thursday, April 15th inst., R. H. Pigeon, Esq., in the Chair, the foregoing Report having been read, it was

Moved by Mr. Payne, seconded by Mr. Wilkinson, and

Resolved, That this Report be received, and the best thanks of this Meeting be given to the Committee for their past exertions.

Moved by Mr. Dinneford, seconded by Mr. Hudson, and

Resolved, That the Report be printed, and be circulated at the discretion of the Committee.

Moved by William Allen, F.R.S., seconded by John Bell, and

Resolved, That for the purpose of protecting the permanent interests, and increasing the respectability of Chemists and Druggists, an Association be now formed under the title of the "Pharmaceutical Society of Great Britain."

Moved by Mr. Morson, seconded by Mr. Davy, and

Resolved, That the present Committee be requested to frame Laws and Regulations for the government of the Society, to be laid before the next meeting of the Members for confirmation and adoption.

Moved by Mr. Savory, seconded by Mr. Gifford, and

Resolved, That the Thanks of this Meeting be given to Richard Hotham Pigeon, Esq., for the able and satisfactory performance of the duties of Chairman; and also for having afforded every accommodation to the Committee in their meetings at his house in Throgmorton Street.

List of Committee.

Allen, William, F.R.S., Plough Court.
Alsop, Robert, 15, Sloane Square, Chelsea.
Barron, Charles, 6, Giltspur Street.
Barry, John T., Plough Court.
Battley, Richard, 32, Lower Whitecross Street.
Baxter, George, 114, High Holborn.
Bell, Jacob, 338, Oxford Street.
Brigg, Edwin, 48, Wigmore Street.
Butler, Thomas, 4, Cheapside.
Davy, Charles, 100, Upper Thames Street.
De Castro, Samuel, 25, Great St. George's Place, Knightsbridge.
Dinneford, Charles, 172, New Bond Street.
Ellis, John, 225, Upper Thames Street.
Farmar, Robert A., 40, Westminster Road.
Foulger, Samuel, 133, Ratcliffe Highway.
Gifford, Joseph, 104, Strand.
Green, Samuel, 1, Harleyford Place, Kennington.
Hanbury, Daniel, Plough Court.
Herring, Thomas, 40, Aldersgate Street.
Horner, Edward, 20, Bucklersbury.
Hudson, William B., 27, Haymarket.
Ince, William, 31, Southampton Street, Covent Garden.
Keating, Thomas, 79, St. Paul's Churchyard.
Descher, J. S., 4, Cripplegate Buildings.
Lowe, William, 47, Blackfriars' Road.
Mayhew, Samuel M., Camberwell Green.
Morson, Thomas, 19, Southampton Row.
Payne, Charles James, 5, St. Martin's Court.
Pigeon, Richard Hotham, 31, Throgmorton Street.
Pound, Matthew, 198, Oxford Street.
Savory, John, 143, Bond Street.
Simkin, Edward, 2, New Cavendish Street, Portland Place.
Smith, Joseph, 29, Haymarket.
Smith, George W., 125, Lower Thames St.
Squire, Peter, 277, Oxford Street.
Stamper, Ralph, 140, Leadenhall Street.
Toller, John, 18, Conduit Street.
Walker, Thomas, 48, Tooley Street.
Waugh, George, 177, Regent Street.
Winstanley, Edward, 7, Poultry.

The following is the circular accompanying the copy of the Report, which the Secretaries have been sending round to the trade:—

"Sir,—We forward for your information, the Report of the Second Meeting of the London Chemists and Druggists, and hope that their proceedings will obtain your approval.

"The Committee trust that the importance of union at the present time, and the advantages which must result from its continuance, will induce Chemists and Druggists in all parts of the kingdom to become members of this Society.

"The Committee will thank you to forward, as early as convenient, and in as complete a manner as possible, a list of all the Chemists and Druggists of your neighbourhood, as a means of facilitating our future communications with them.

"We have the honour to remain,
"Your obedient servants,
R. A. Farmar,
Geo. W. Smith,
Secretaries.

The above Report will prove highly gratifying to our readers, and to every well-wisher of that most important class—the Chemists and Druggists—and, more particularly, that part of it which announces the formation of a Society, having for its objects "the protection of their rights and interests, and their improvement and advancement in scientific attainments," under the designation of a title which we think extremely well chosen—The Pharmaceutical Society of Great Britain."

Every resolution which was carried at the meeting commands our most cordial concurrence, and we feel happy that our observations have been, from time to time, without any deviations, such as are now the standing rules of the committee. Had they submitted themselves to be under the government of either College, and particularly under that of the Society of Apothecaries, they would have degraded themselves, and lost sight of their own interests past all redemption. They have, however, declared themselves to be totally distinct from, and independent of, any of these, to whom they have set a noble example to "go and do likewise"—an example which will serve the interests and honor of these

bodies better than any acts of the legislature, unless they be made to enforce complete education, and such examinations as are calculated to prove the qualifications of their members—not a mere show and mockery. That the establishment of an association on such principles as those of the PHARMACEUTICAL SOCIETY is the very best for all parties interested, must be evident, inasmuch as its chief objects are to ensure the education of its members. This will enable them the better to guard their own rights and interests against any aggressions or encroachments—will defy the calumny and malignity of interested parties, and will give security to the public of their qualifications to practise their calling, not only without danger, but with great benefit. The foundation of this society we hail as a great measure, and are confident that it will be the commencement of an improvement in medical practice much greater than can be produced by any bills in Parliament. In relation to the poor, very considerable advantage will be obtained, by the better education of chemists, inasmuch as they will be able to get relief in trifling cases and under sudden emergency, for as many pence as they would have to pay shillings to the apothecary.

Infinite credit is due to the Committee, to whom the whole body of the trade is indebted in a very onerous debt of gratitude, for their manly and persevering struggles, (which have nearly cost one of its chief and most worthy members his health,*) to preserve the trade from utter destruction. We trust and believe that every respectable chemist and druggist will not only join the society himself, but make it imperative on his pupils and apprentices so to do. Nay, we may add, that to co-operate with it will greatly enhance the respectability of its members.

We can now foresee the removal of all difficulties in the way of medical reform, and we advise the disciples of Esculapius to begin in precisely the same way as the chemists have done, and their title to respect will be better secured than by aiming at distinctions not based upon merit.

The numerous schemes of medical reform which have been put before us are by far too chimerical to deserve notice. We see in *The Times* the suggestion of a person to separate the dispensing from the professional part; in this suggestion we had anticipated the gentleman a long time, but we are now quite satisfied of its total impracticability, and therefore have desisted from any further observations upon it.

In concluding our remarks for the present, most urgently do we advise the junior part of our readers, who are engaged in pharmaceutical pursuits, to obtain a more perfect knowledge of those branches of science connected with their business, and not to treat the study of chemistry and other sciences as a mere dry task, as we fear is too often the case. No doubt they are aware that science is dry and uninteresting only to the ignorant, and therefore we do hope they will have more ambition than to be classed with such, and that the admirable course adopted for their benefit by the higher ranks in their profession will not be thrown away upon them. It is quite clear that it is not only conducive to their improvement in science, but likewise to their success and interests in business, that they pay proper attention to such studies as are connected with their calling. If they neglect them, they will find that ignorance is productive of numerous inconveniences and disadvantages; but on the contrary, that a due acquisition of them will prove to them the truth of the observation of Lord Bacon, that

"KNOWLEDGE IS POWER."

* MR. BARRY.

MEDICAL REFORM,—MEETING OF CHEMISTS AT NEWCASTLE-ON-TYNE.

To the Editors of The Chemist.

26, Grey Street, Newcastle-on-Tyne, 23d April, 1841.

GENTLEMEN,

Agreeably with a resolution below, I beg to hand you a copy of proceedings, and to request the favor of insertion in your valuable Magazine, if you deem proper.

Yours faithfully,
G. WILSON CHALLONER.
Hon. Secretary.

At a numerous and respectable public

meeting of Chemists and Druggists, convened by circular, and held at the George Inn in Newcastle-on-Tyne, on Friday 23d of April, 1841, for the purpose of taking into consideration the propriety of addressing the London Association, on the subject of compelling Chemists and Druggists (hereafter commencing business) to undergo examinations, and imposing licenses on all persons selling drugs, in order that the retail trade may be kept in its proper channel:

Mr. Proctor in the Chair.

It was moved by Mr. Bustin and seconded by Mr. Gibson, and—

Resolved, That the trade of a Retail Chemist and Druggest involves many and great responsibilities deeply affecting the interests of the public. It is therefore the opinion of this meeting that much benefit would result to all parties if a regular examination and qualification were compulsory on all persons prior to commencing this business.

Moved by Mr. Gibson and seconded by Mr. T. Ridley, and—

Resolved, That this meeting cordially adopts the principle of a licence being imposed on all persons selling drugs.

Moved by Mr. Garbutt and seconded by Mr. H. Gibson, and—

Resolved, That Mr. Edward Wilson Challoner be requested to forward copies of these proceedings to R. Pigeon, Esq., and to the Editors of *The Chemist*, recommending steps to be taken for the accomplishment of this most desirable object.

Moved by Mr. E. Wilson Challoner and seconded by Mr. Smith, and—

Resolved, That the cordial thanks of this meeting be given to the "London Committee," and also to the "Editors of *The Chemist*," for their attention to the interests of the trade.

Signed on behalf of the meeting,
W. Proctor, Chairman.

Mr. Proctor having left the chair, the thanks of the meeting were unanimously voted to him for his able and impartial conduct.

MEDICAL REFORM AS AFFECTS DRUGGISTS.

LETTER II.

To the Editors of The Chemist.

Gentlemen,—The thanks of the Chemists and Druggists must, I think, be awarded to Messrs. Hawes, Wakley, Warburton, and Co. But for those gentlemen we had never heard of any stir among the plodding servants of Esculapius. The latter, it is true, have long borne a heavy and a drudging burden,* but I doubt if any thing would have incited them to activity and resistance had they not been goaded on to it by oppression, still more oppressively overbearing. Mr. Hawes perhaps has greater claims than any upon the gratitude of chemists and druggists, because his wish was to place their rights and privileges under the "protection" of the legislature. In the same manner, I may say the liberties of the poor of this country have been placed under the "protection" of the government. We live in the very age of liberal-mindedness; and yet there are many curious occurrences that ought not to pass by without remark,—some indeed that cannot without awakening our amazement.

It was not, Gentlemen, until liberals had laid down the law, that poverty was to be considered a crime punishable with bonds and imprisonment; nor was it supposed till declared by liberals, that to administer relief to the sick, to ease the smart of pain, to soothe the anguish of disease, were crimes to be visited with a sure and speedy punishment by the hand of the law.

"Thousands of people" says *The Lancet*, "are annually destroyed by the prescribing druggists, quacks, and other impostors." This, if a grave assertion of that veracious journal, must no doubt be the fact. But it has not yet been asked how many hundreds of those thousands would otherwise have been brought to a speedy death in union workhouses,† driven there by doctors' bills passing through the courts of requests. Either a gracious Providence must be pleased to withdraw disease entirely from the house of the destitute, or the care of his beloved poor must henceforth be left to the mercies of the "doctors,"—

——"Men of nicest honour and fine sense.
Yet wanting sensibility!"

or consigned to those whited sepulchres fitly called "union" workhouses, as implying an union of life with the grave.

Many blessings upon our old British constitution: it is considered that if Mr. Hawes had been able to carry his oppressive clauses into a law, it would also have carried with them a most flagrant violation of the liberty

* It will be found by calculation that retail chemists are engaged in business during a time every week not less than 9 mechanics' days; being $6 + 3 = 9$, or *one-half* of time *more* than the commonest mechanic.

† Mr. Wakley is now labouring to show that, of all things in the world, union workhouses are the largest contributors to the bills of mortality.

of the subject. In spite of all this we shall find that no effort will even now be left untried that either cunning can suggest, or hardihood venture upon. Verily, the medical reformers are attempting too much. They began by setting right and justice at defiance; they rushed headlong to the work. Heaven and earth were to be moved to procreate medical reform. What is the result? *Parturiunt montes!*—but it will turn out to be a mere case of abortion.

A very sensible writer in the *Quarterly Review** says, that though it is just that none but qualified practitioners should be appointed in all cases where the public have to provide medical relief for their fellow-creatures, yet that "each individual in society, with respect to his own complaints, *has a right to consult whom he pleases.*" I might add, too, that when the legislature shall establish the principle of concerning itself about the health of individuals *as such*, there is no reason why many other matters that relate thereto should not be brought under legislative care. Why, for example, should not laundry-women be liable to fine or imprisonment for sending home damp linen? But the grand 'saving clause' in all such attempts at legislation for individuals is—absurdity.

To take a different view of the subject, I shall suppose that the general practitioners could obtain all they fancy they should like, would they not soon be glad to return to the old system? The anxiety, uncertainty, and responsibility that attends upon the treatment of serious disease already bears down their health and strength, and sends them to the grave earlier than other men. Would this harass and toil be diminished if all the druggists could be banished from the land? One man perhaps has cut his finger and wants it dressed immediately; another must be made a tooth or more minus, instanter; a third has scalded his largest toe, and must needs have it inspected. Graver matters all the while are calling the good man away, and these perchance to be interlarded with toothaches, headaches, heartaches, and bellyaches. O that the medical millenium might arrive! I could not desire a severer retribution upon the knavery and avarice of medical reformers, than for the petty distractions of the chemist and druggist to be mingled with the toil and anxiety of the general practitioner.

But how stand the future prospects of the chemists and druggists? Novices at present in all matters of cordiality for one another, they have yet to experience the noble advantages of association. The application of the homely fable of the bundle of sticks is a sealed mystery to them, or nearly so. They have hitherto been used to think that the interests of individuals can only be promoted by the tortuous purposes of *self*. Competition and depreciation (whether of drugs or druggists) have been the only process, in many instances, through which they have proposed to get rich. But a new light is dawning upon them; they are now rubbing their eyes and beginning to see what a mass of *ærugo* a grovelling spirit has coated upon them. Agreed upon the general expediency of association, they are even showing some small signs of public spirit. This, however, is not sufficient. They must thoroughly arouse themselves to the business—shake off the gross lethargy of selfishness, and combine, like other parts of the rational creation, to form such a powerful body as may benefit every individual.

The new society, to be called the 'Pharmaceutical Society of Great Britain,' has been projected at a most appropriate time, and under the most favourable auspices. Present space does not admit of detail, but I must say that the men who are concerned in organizing that Institution, afford the strongest guarantee to all parties, of its thorough completeness and efficiency. Nor will it be wanting in respectability either, as long as men so venerable and distinguished as William Allen, with the other gentlemen of the committee, are to be numbered among its members. What inducement do the druggists want more? I conclude they will not require to be forced into an institution that has been formed for the protection of their interests. Let me give them this one small caution, it may not be long before their interests will otherwise be forced from them.

I remain, Gentlemen,
Your obedient Servant,
W. G.

* Dec. 1840, p. 57.

HOMŒOPATHY.—ANSWER TO MR. P. H. HARPER.

BY MR. YOUNG.

In the articles which appeared in *The Chemist* on the subject of Homœopathy, I endeavoured to give a rough sketch of the leading differences between that system and the science of medicine as practised by Allopathists: I had intended to have given afterwards a few of the leading principles with which all persons who intend to give Homœopathy a trial ought to be acquainted; but as Mr. P. H. Harper has published a "Refutation of the Homœopathic Doctrine of Hahnemann," I think it imperative on me to notice Mr. Harper's notable effusion, before proceeding further, merely remarking that it is hardly fair to endeavour to refute

that which was written merely to convey to others an outline of a science but little known, and which, consequently, was not composed for the purpose of discussion; but nevertheless I shall not shrink from the encounter. I will take Mr. Harper's arguments (query, assertions?) in the order in which he has arranged them. In the first place, we learn that Brownism is the mother of Homœopathy, and that had it not been for Brownism, Homœopathy would "never have extended beyond the sphere of Hahnemann's own circle." For my part I am at a loss to conceive who or what this venerable personage or system may be which has given birth to the monster Homœopathy. Mr. H. is truly and indeed an Allopathist, not content with attributing to every disease a material cause, he must needs find a cause for Homœopathy.

"The absurd doctrines which it sets forth would never have found place, except among persons incapable of thinking for themselves." Indeed—can this be true? Is it possible that Bigelius, Rau, Stegman, Hufeland, the accomplished Quin, and the enlightened Dunsford, are men who cannot think for themselves? Is it possible that Stratten, Currie, Epps, and upwards of 300 gentlemen who write M.D. after their names, are incapable of judging for themselves!—Oh, Mr. Harper!!

Mr. H. goes on to say, that "All that Hahnemann ever said or published amounts only to assertions." Has Mr. Harper ever seen or read the "Materia Medica Pura?" If he has not, he knows nothing of the science taught by Hahnemann, and ought not to write a word on the subject; if he has both seen and read it, what is his definition of the word assertion! He sees before him two thick 8vo. volumes, filled with an account of the effects of different medicines, on individuals otherwise in health, their effects accurately noted, the duration of those effects, both primitive and secondary, is also put down with fidelity: yet these experiments are called "assertions!" Oh, Mr. Harper!!

"They (the Homœopathists) regard only the particular pains and debilities of which the varieties of sickness are composed. The proximate causes are likewise overlooked, though the remote causes are more studied." It is true, they *do* regard those particular pains, &c. of which sickness is composed in acute diseases,* and if they remove those symptoms, and restore the patient to health, what more is required? But surely Mr. Harper does not think it a crime for any healer to study the remote cause more than the proximate. How is the disease to be cured by removing the proximate, when the remote cause still operates upon the system?

I beg leave to assure my opponent that the proximate causes of disease can seldom be mistaken, and that Homœopathists do not refer them to "dynamic power," but to derangement of that power." Because all, or most diseases are attended with more or less derangement in the circulation. "I suppose," says Mr. Harper, "that Hahnemann would always lay the cause there." This is a decided case of the pot calling the kettle black, for it is "the very error," the deadliest error the Allopatbists are guilty of; and proceeds Mr. H., "let us for a moment, suppose it is so—I cannot myself allow such a thing,—no not even for an instant." It is perfectly clear to me that Mr. H. knows nothing whatever of the first principles of the doctrine of Hahnemann.

Mr. Harper next proceeds to ridicule the Homœopathic doses, quoting extreme cases, and answering for the Homœopathists, as to their remedies and doses; but calculations about the area of the great pyramid, &c. &c. will not serve instead of arguments. If these doses are so inert, how was it that Dr. Uwins, one of the most celebrated physicians, cured typhus and other fevers Homœopathically, as testified in a pamphlet, wherein he published several cases just before his death.†

But how the supposed cases refute the fact of the Pathogenetic effect of medicines on the healthy subject, I am at a loss to conceive. Does Mr. Harper mean to say that medicines do not produce disease when taken internally? This would be carrying the assertion rather too far; because, if true, arsenic, copper, mercury, belladonna, &c. &c., might be swallowed with impunity. Does not mercury, when taken by an healthy individual, produce salivation, &c.? An Allopathist has lately taken the trouble to write a book, wherein he proves that the affections usually called "secondary symptoms" are produced by the use of mercury, or rather by the abuse of that remedy.

Mr. Harper asks—"Why does it (Homœopathy) not act as it ought to do, if there were any truth in it, with as much certainty in apoplexy or pneumonia as it does in the safe-ground the Homœopathists occupy, of the chronic diseases of the nervous system, in hysteria, and in all the varied forms and hydra-headed kinds of dyspepsia,

* In the papers which previously appeared in *The Chemist*, no mention was made of Hahnemann's division of diseases into chronic and acute, as I thought it better to defer that part of the subject until I came to treat of the Practice of Homœopathy.

† Homœopathy *versus* Allopathy, by Dr. Uwins.

in wbicb the merest tyro knows that oftentimes imagination acts with far more power than the most potent drugs?" "Allopathically applied" should have been added to the sentence, and it would have heen perfectly correct: but I would only ask why (if these diseases are to he cured hy acting upon the imagination) physicians dose their patients in such cases with their filthy compounds, and give purgatives until the bowels will not act without them. Why do not they content themselves with curing by acting upon tbe imagination of their patients, and spare them the misery of swallowing medicine after medicine, until death puts an end to both physic and fee-taking? "Aye, there's the ruh!" It surely is not possihle to act upon the imagination of infants, and yet tbe Homœopatbic medicines act witb more certainty and facility with them than in any otber class of patients. I have also seen patients wbo have heen treated Homœopathically, and yet knew no more of it than Mr. P. H. Harper; or, to speak more plainly, knew nothing of the science, and yet were cured.

With regard to the "18 or 20 patients weekly," who presented themselves with tbe symptoms described hy Mr. H., did tbat gentleman take the trouble to inquire whether they were engaged in any occupation or employment where mercury was used in any shape or way—if not, be has given to the world a description of a disease hitherto unknown, and tberefore not a case in point.

The increase of power is also denied to medicines after trituration. "Supposing electricity to he developed during the trituration, how is it retained in the molecules of the medicines, when, as is well known, that electricity however developed, has an overwbelming tendency to discharge itself through the surrounding objects?" I answer, that supposing it to he electricity (mind, I do not say that it is), it is confined in the globules in the most easy manner possible, hy keeping them in perfectly closed glass vessels, and any one wbo has seen Homœopathic medicines, knows full well that it is invariably done.

"Dr. Muret, of Morges, wishing to determine the effect of trituration on a medicinal suhstance, tried tbe following experiment:—

"Having procured two rabbits of the same age and strength, he gave to one a grain of hydrochlorate of harytes, wbich had been pounded and rubhed for an hour. The animal almost immediately fell down, was violently convulsed, and sunk into a moribund state. To the second, the same quantity was given without having been suhmitted to any manipulation, and the animal was very slightly affected hy it, merely losing, for a short time, power over the bind egs, and that not until tbe medicine had been taken nearly half an hour. In order to prevent the possihility of error, the experiment was reversed, and tbe effect was precisely the same."*

"They will perhaps be so good as to sbew us the exact seat of disease in fever, bydrophobia, &c." Now, homœepathists direct their medicines to tbe exact seat of tbe symptoms, surely not to the seat of disease itself, which they do not profess to know, (except in chronic diseases),—they therefore direct their remedies to the principal symptoms, hut they do not call those symptoms, as the allopatbists do, tbe cause of the disease: such and such a disease, say the allopathists, is caused by disease of the mucous membrane of the stomach, forgetting in all the pride of their hoasted diagnosis, that a deviation from the normal state in the mucous membrane, must have a cause, and therefore is only a symptom. "Tolle causam," "tolle causam," continually they cry.—God help their patients!

"But the homœopathists may say—'Well, we succeed in curing our patients: how is tbat, if our doctrine he so ahsurd?' granted: hut how do they succeed? first, hy inspiring great confidence in their remedy." Mr. Harper grants the Homœopathists can cure their patients: no reasonable man can wish for a more sweeping concession than that; the only wonder is, tbat Mr. H. took the trouble to write against a science wbich he admits does all that can he required of it; why not at once embrace Homœopathy? for I fearlessly assert, tbat allopathists CANNOT cure their patients.

The next observation of Mr. Harper's, is a beautiful instance of the discriminating powers of a lady who did not known fulminating halls from homœopathic globules: really tbis must have heen ratber a strange mistake, seeing that fulminating halls (at least all I have seen) are the size of a field-bean, and homœopathic glohules no larger than millet seed; and, moreover, are never hy any chance put into hoxes, not to say any thing ahout the coincidence of the two boxes being alike; really this is too ahsurd. Instead of patients having great confidence in Homœopathy, they generally are very incredulous as to the result of the treatment, hut once treated after this metbod, there is no danger of their return to tbe hleeding, hlistering, and purging system. Diet, in Homœopatbic practice, is rather severe in some, no douht, and is a means of enahling the physician to cure with much less doses, thereby avoiding reaction and aggravation of tbe malady, yet it lasts only while the medicine continues to be taken. But the

* Dunsford's Practical Advantages of Homœopatby.

diet of the allopathists is generally a palliative remedy, and when other means fail, they lay down rules of diet for the term of a man's natural life: there is a wide difference between the two, I calculate.

"A well directed pause often hastens, and almost perfects a cure." I can easily imagine that when a patient is being bled, blistered, leeched, and purged, and all this by no sparing hand, that a PAUSE will most certainly hasten the cure, and I am inclined to think, that if these PAUSES were more frequently taken advantage of, many and manifold would be the benefits conferred by allopathists upon their suffering patients.

"Homœopathy has, and undoubtedly will have, numerous proselytes," observes Mr. Harper. I am happy to say that it has, and where five years ago there was one convert, five hundred will now be found. The science is steadily increasing; there are now three dispensaries where the poor may avail themselves of its benefits; any one who will take the trouble to read the "Annals of the Homœopathic Dispensary," by Dr. Currie, will find those benefits are no slight cause of the progress this science is making.

As a concluding proof that the minuteness of the dose does not alter the good effect of the remedy, I will take the liberty to give one case out of many published by H. Dunsford, M.D.

"A young lady, aged ten, was seized about two years ago, with inflammation of the tonsils, which rapidly increased so as to occasion a dread of suffocation. On examining the throat, I found the tonsils enormously swelled, so as almost to touch one another. The little patient was compelled to sit up in bed with her mouth open and the tongue protruded; the eyes were suffused, as if starting from their sockets, the pulse one hundred and thirty. I was apprehensive that in this stage of the disease nothing would arrest its course, and feeling that the least increase in the size of the inflamed tonsils would instantly produce a fatal result, I prepared for the operation of puncturing them. In the mean time a dose of aconitum was administered, and soon afterwards belladonna in solution. The effect exceeded my expectations; the fever became less, the swelling of the tonsils gradually subsided, and without suppuration the parts returned to a normal state. Thus a disease which threatened the existence of the patient, was overcome in the course of forty-eight hours. Carbo veget., and other antisporic medicines were afterwards administered, and the result has been, that although previously very liable to such attacks, she has remained free from them ever since."*

Lastly, I beg to record my conviction, "that eventually people's eyes will be opened" to the truth and manifold advantages of the system taught by Hahnemann; and let its doctrines be ever so full "of absurd and untenable dogmas," still, by Mr. Harper's own confession, IT CURES DISEASE. What more can be wished for by a patient?

EXPERIMENT ON POISONING BY ARSENIC: MADE BEFORE THE ROYAL ACADEMY OF MEDICINE, PARIS.

BY M. ORFILA.

(*Continued from No. XV.*)

THIRD SITTING; NOVEMBER 1, 1840.

The sitting commenced at two o'clock. M. Orfila announced that on Wednesday, the 28th of October, at ten o'clock in the morning, he had made four experiments before MM. Husson, Amussat, Ollivier (d'Augers), Soubeiran and Caventou, members of the Commission, with the view of proving that dogs poisoned by solid arsenious acid or stibial tartar, applied to the sub-cutaneous cellular tissue of the thigh, died in the space of from twenty to forty hours, if they are left to themselves and do not pass urine; whilst they were cured if made to do so in considerable quantities, by means of aqueous or diuretic drinks.

Next day, the 29th, at ten in the morning, one of the dogs poisoned by arsenious acid, to which no drink had been given, and which had not once made water, was dead. The other dog submitted to the action of arsenious acid, had been treated by diuretics, and did not seem to be perceptibly affected. One of the dogs poisoned by emetic was in a desperate state, although the diuretic drink had been three times administered to him; but he had not once made water. The other dog poisoned by emetic was tolerably well; but he had made water twice during the night, and continued to do so abundantly: the secretion was favored by letting him drink water.

The same day, the œsophagus of two little dogs was detached and tied; the ligature was maintained until the 30th, at ten in the morning. The dog poisoned by emetic, which had not made water, died during the

* "Dunsford's Practical Advantages of Homœopathy,"—a work well worth the trouble of reading by those who wish to know the effects of Homœopathic practice.

night of the 29th. The other two dogs had almost recovered.

At the opening of the sitting, M. Orfila showed the four dogs cured, namely, the two whose œsophagus had been tied on the 29th, and the two which had been poisoned on the 28th, by ten centigrammes of arsenious acid and emetic. The liver and urine of these animals were left for examination until the next day.

At twenty minutes past ten, twenty-five centigrammes of arsenious acid, dissolved in a hundred and thirty grammes of water, were administered to a very healthy moderate-sized dog, and the œsophagus was tied. At two o'clock the animal was dead.

At twenty minutes to eleven, the same dose of poison, also dissolved in 130 grammes of water, was administered to two small dogs, which were allowed to vomit; these animals will have warm water administered to them, and will be cured if they vomit a few minutes after swallowing the poisonous substance.

Fifty centigrammes of finely powdered arsenious acid were administered to two dogs; warm water was given to them. These dogs will be bled three hours after the commencement of the experiment, and will he cured if they have vomited. One of these dogs was poisoned at a quarter past eleven, and the other at twenty-five minutes past. At two minutes past eleven, a gramme of the same poison was administered in the solid form to a little dog: the animal took only some warm water, and will he cured, if he vomits sufficiently.

One hundred and twenty-eight grammes of broth, sixty-four grammes of wine, and as much brandy were injected into the stomach of a moderate-sized dog. This injection will he repeated at half past one and at a quarter past four. The animal will perish in twenty-four hours, although not prevented from vomiting.

The desiccation of a putrid human liver was then proceeded with, after having been cut into small pieces. The dried product was carbonised, in a procelain capsule, by eight hundred grammes of concentrated nitric acid; this carbonisation proceeded slowly and with difficulty; nevertheless, a very dry carbon was obtained. The latter was boiled for twenty-five minutes in distilled water. The filtered solution, which was of a blackish color, introduced into a Marsh's apparatus, previously tested, did not yield arsenic. Only five or six opaque white stains were obtained, in which none of the characters of arsenical stains were observed; after twenty minutes' trial a drop of a concentrated solution of arsenious acid was put in, and almost instantly brilliant arsenical stains were deposited.

To ascertain whether the alcoholate of potassa, which we are frequently obliged to use in medico-legal investigations, contains arsenic, sixty grammes were dissolved in distilled water: the liquor was saturated with pure sulphuric acid, and the sulphate of potassa was introduced into a previously tested apparatus: no arsenical stain was obtained, even after half an hour. On the addition of a drop of a concentrated solution of arsenious acid, a considerable number of arsenical stains were immediately obtained.

If it should happen that an individual, poisoned by arsenious acid, was treated by stibial tartar and died, it might occur that in the medico-legal investigations, to which the body would be subjected, both arsenical and antimonial stains would be obtained; it is important, therefore, to draw attention to this point. The arsenico-antimonial stains vary in appearance according to the proportions of arsenic and antimony that they contain. When the former predominates, they are of a light brown color in certain points and bluish in others: if the antimony is most abundant, they are of a deep blue, although here and there the brown tint of arsenic may be perceived: both, if they are very thick, are of a very deep color, and not very brilliant. On some of these stains being submitted to the action of a flame of pure hydrogen, the arsenic was instantly volatilised, and the stain, then reduced to a simple antimonial one, presented the blue or grey color of the latter; it was extended by the action of the flame, and acted in all respects as a pure antimonial stain. But the best means of attesting this mixture consists in dissolving these mixed stains in pure concentrated nitric acid; in evaporating the mixture to dryness; in treating the yellow residue thus obtained by boiling water, which dissolves the arsenic acid in a few minutes, and leaves the yellowish antimonious acid; it is left to settle, and is decanted; the solution of arsenic acid being evaporated to dryness, gives a residue which nitrate of silver immediately converts into brick red arseniate of silver. The antimonious acid may be instantly detected by dissolving the yellowish residue above mentioned, in a few drops of pure boiling hydrochloric acid: on this solution being diluted with a little water, and on a few bubbles of hydrosulphuric acid being driven into it, an orange colored precipitate of sulphuret of antimony is immediately obtained. This operation, made before the sitting, furnished the indicated results.

The stains of sulphur are yellow, dull, and insoluble in nitric acid. The stains of iron are brown, dull or shining, fixed, and instantly dissolved in hydro-chloric acid, with which they form a yellow chloride, which, being evaporated to dryness, turns blue with

the ferro-cyanuret of potassium, and presents all the characteristics of salts of that metal. After having announced that there has been found in shops, hydrated peroxide of iron containing arsenic, probably in the state of arseniate, and that this metal also exists in colcothar, in certain sulphates of iron of commerce, and in certain carbonates of iron, M. Orfila boiled for an hour and a half four ounces of arsenical colcothar (dry peroxide of iron) with pure sulphuric acid, diluted with a third of its weight of distilled water; the liquor, to which was added a little water as it evaporated, was afterwards filtered and introduced into a Marsh's apparatus, previously tested; there was immediately deposited on the capsule several large and fine arsenical stains; these stains are always mixed with iron.

The same dose of colcothar exhausted with boiling distilled water, or with water mixed with two grammes of alcoholate of potassa, yielded liquors from which no traces of arsenic were obtained by means of Marsh's apparatus.

With regard to the soils of certain cemeteries, M. Orfila is of opinion:—

1st. That there exists very small portions of arsenic in some of them:

2d. That this arsenic cannot leave the earth to enter into the organs of a body buried in it, because it is in the state of a salt which is insoluble in boiling water; because, to detect it, the prolonged action of an energetic agent — boiling concentrated sulphuric acid — is required; and because the skin only very difficultly allows poisonous solutions to penetrate it, even when the body is steeped in a bath composed of those solutions:

3d. That it may happen that the body of a poisoned person, after it has been buried some time, may abandon to the earth a portion, or even the whole of the arsenious acid which it contained at the time of death, because the ammonia which it developes during putrefaction converts the arsenious acid into a soluble arsenite, which is carried away by the liquids arising from the body, and by the rain. It may easily be conceived that this arsenite may be promptly decomposed by the sulphate of lime contained in the earth and changed into insoluble arsenite of lime.

After some considerations in support of these assertions, M. Orfila introduced into a Marsh's apparatus, previously tested, a solution prepared by boiling seven pounds of earth from the cemetery of Montparnasse, with distilled water. The liquor did not give any trace of arsenic. Another liquid obtained by digesting on it, for twenty-four hours, without heat, pure concentrated sulphuric acid, then boiling it for six hours, was put in another apparatus, previously tested; this solution instantly gave several brilliant arsenical stains. Finally, to terminate this subject, it was shown that a solution of arsenite of copper immediately decomposed sulphate of lime, giving rise to a whole precipitate of arsenite of lime.

Afterwards passing to the subject of *post mortem* imbibition, M. Orfila showed that if a poisonous liquid be introduced into the stomach or rectum of a body already cold, it will traverse the digestive canal, and extend, by degrees, first into the parts which are in immediate contact with the canal containing the poison, and eventually into the more distant organs.

"The medico-legal consequences of this fact," said M. Orfila, "are of the highest importance; in the first place, it is evident, that in an investigation made in a case of poisoning, more poison should be extracted from certain organs, if the chemical analysis is made a long time after death, than if done twenty-four or thirty-six hours after, because, in the first case, the organs in question will contain, independently of the poison observed during life, that which has come there through imbibition."

But there is another fact, of a more serious appearance; a villain might, with the design of accusing an individual of having poisoned another, introduce into the stomach, and particularly into the rectum of a corpse, a poisonous substance which would be detected by analysis, and which might give rise to the suspicion that the body was that of a person who had been poisoned. This, to the honour of the human race be it said, has never occurred. But if it were hereafter to become the subject of medico-legal investigation, it would not be difficult to put the truth in its proper light. M. Orfila presented, as a means of solving the problem, a great many considerations drawn from the symptoms experienced by the patients, from lesions of the tissue proved after death, from the quantity of liquid or solid poison found in the digestive canal, from the situation of the poison in that canal, from the effects produced by the poison on the dead tissues, whether applied immediately, or some hours, after death, and from the difference of legitimate action between poisons introduced during life, or after death, &c. He concluded with a consideration, which, alone, is sufficient to resolve the difficulty. In the case of poisoning during life, not only is the poison discovered absorbed in all the organs, but likewise between each part of every organ; thus, the liver of a man poisoned by arsenious acid will yield arsenic, whether the superior or the inferior portion of that viscus be examined; it is not so, soon after death, when the poison comes there by imbibition; then, indeed, the part nearest to the stomach is

arsenical, while that farthest from it is not so. And, even admitting that, in consequence of the progress made by the imhibition, the whole of the liver should contain arsenic, the lungs, the heart, and more especially the hrain, can contain it only a very long time after death.

Besides, it has been ascertained that certain poisons are decomposed hy the organic fluids with which they are in contact; so that, having become insoluhle, their progress is stopped. Thus the effects of imhihition are often neutralized: in these cases, it may easily he conceived that the parts most distant from the stomach and rectum, into which the poison has heen injected after death, never receive the smallest portion of the poisonous substance.

In support of these considerations, M. Orfila performed the following experiment:—

He opened the hody of a woman, who died on the 27th of October, into which a solution of 60 centigrammes of arsenious acid, in 140 grammes of water had heen introduced at ten o'clock in the morning of the 30th. The hody had heen lying on the right side ever since the injection. The superior portion of the left lung was removed: a slice was cut from the superior portion of the liver, and another from its inferior portion. These three portions of organic matter were dried in three new porcelain capsules. They were carhonised hy pure concentrated nitric acid, and the three carhons were hoiled in distilled water for half an hour: the filtered liquids were introduced into three Marsh's apparatus, previously tested: no arsenic was ohtained from either the lung or the upper portion of the liver: the inferior portion of the latter organ,—that which had heen in immediate contact with the stomach,—gave a few small shining arsenical stains.

The sitting terminated at a quarter past four.

ENCOURAGEMENT OF SCIENCE IN ENGLAND.

To the Editors of The Chemist.

Gentlemen,—

Knowing how ahle and strong an advocate your valuahle Journal is, for the improvement, advancement and encouragement of the arts and sciences, and all persons connected therewith, I take the liberty of saying a few words, in reference to the same; though with great diffidence, heing aware of the many censures and criticisms I expose myself to, hy thus publicly expressing my humble sentiments; at the same time, submitting them for the public consideration, hoping that the subject may he seriously taken up.

In the first place I would direct your notice to the fact of the French nation possessing the greatest genius for invention, and the British for improving on the same. Is not this a shameful degradation to our nation? Are we so degenerated a race, as to sit down tamely, knowing that the French Chemists are excelling us? Have we not the spirit, genius, mind, perseverance and emulation of our ancestors? Is not the *vis vitæ* handed down from one generation to another, and does it not strengthen and increase, in proportion, as the civilization of the world advances? Certainly, but why have we not proofs of such? It is easily answered. In France, in the first place, there are free institutions, having liheral-minded men to preside over them. Is it so in England? If a man is desirous of becoming an useful member of society, are there any public schools open for talent to improve itself in? Is a man to be despised, because his circumstances will not allow him to send his children to an medical college? If poverty is not a crime, why should not these people also partake of the henefits, which a civilized nation, in an enlightened age, affords? Why should we not expect something from this class of society? In justification of which question, I would enquire, from what station in life did many of our most clever and leading men of the day spring?

In the second place, I would ask, who are these French Chemists? They are a select hody of men, having good education and possessing well cultivated minds; which are ensured to the members of the science, by every one heing obliged to undergo a strict examination, hefore entering upon the duties of his profession. Is it not owing to any persons heing ahle to set up in business, without previous examination, that we are accounted inferior to the Chemists in France? Do not grocers and such description of people, presume to sell drugs in the present day? And can such men have a proper knowledge of the medicines they are vending? It is too true, but I trust the day is near at hand, when the public will he convinced of the danger attending such a state of things, and that a total stop will he put to it.

In the third and last place, can it he wondered at, that most of the newly discovered medicines have heen hrought to light through the unceasing labour, study and deep research of the French chemists, and that it is to them we are highly indehted for the same, when it is known, that public rewards are distrihuted on such occasions? Have we an examination, or distrihution of public

rewards to stimulate us to study so vast, unfathomable and pleasing a science as chemistry, the elementary principles of our very existence, the atmosphere we breathe and the world we live in; a science, which displays to all, a Supreme Being's sublime works, which are systematically arranged, and to be accounted for by certain natural laws, by means of which, the globe itself is maintained in proper order; a science, which unfolds, to the man of deep research and persevering study, the hidden secrets of nature, thereby raising him above the common level of mankind, enabling him to behold the various daily changes and phenomena of nature, and opening a wider expanse for his researching mind to work upon, at the same time being a continual source of reflection and amusement? No; such is not; and consequently, let us endeavour to obtain the privileges of free institutions, examinations, and public rewards; let us arouse the organs of our brain into a state of activity, and make known to the world, that it is not only in one, but in every branch of science, that we equal, if not excel all other nations. In like manner as England's flag waves victoriously over the whole seas, so let her inventive genius and spreading flame resound from pole to pole; and as the conqueror combines mercy with strength, so let the man of genius, to knowledge, add benevolence and liberality, by making known, for the benefit of the public at large, his new discovery or invention.

Should the contents of this letter be judged consistent with the dictates of common sense and reason, I earnestly trust that the many, whose influential power is great, will partake, equally with myself, of the zealous feeling, which I entertain in the cause, and may such be proved by their exertions in its favour.

Sincerely trusting you will, at your own convenience, insert this letter in your valuable Journal, should the subject be considered worthy,

I remain, Gentlemen,

Yours very respectfully and obliged,

ALFRED WATTS.

March 4th, 1841.

GILDING AND SILVERING PILLS.

GENTLEMEN,—

Feeling assured that your useful and valuable Journal is at all times acceptable for the attainment of knowledge, I take the liberty of enquiring through the medium of "The Chemist" the best way of gilding and silvering pills, as the present mode adopted by druggists is very inferior and attended with great waste.

I should feel obliged by some of your numerous readers throwing a light on the subject that may benefit the trade in general.

Your obliged,

B. B.

LATE HOURS, &c.

To the Editors of The Chemist.

GENTLEMEN,—

In reply to F. B. B's letter, addressed to you, dated 30th of November, 1840, I beg to suggest a much better plan than the one proposed by him, which, after fourteen years' trial, I have found to work well for the comfort and improvement of the young men.

They open the shop at six o'clock every morning in the summer season, and at a quarter to seven in winter. They close the shutters every night, Saturday excepted, at nine o'clock. I allow them from six in the morning till half-past eight o'clock before they wash, and three quarters of an hour for washing, &c. Every Wednesday in each week two of them are at liberty alternately from a quarter to two o'clock until five, for recreation; and every evening, two have from seven until nine o'clock for reading in a small back office, so that I may know they are not spending the time allowed foolishly; and in order to give them a still better chance for improvement, if so disposed, I subscribe to the Mechanics' Institution, and allow them to get out any book for improvement they may wish to have; first shewing it to me for my approval. If this meets your approbation and you think it worthy of insertion, you will oblige

A CONSTANT READER OF THE CHEMIST,

Salford, March 14, 1841.

LATE HOURS AND SUNDAY TRADING.

To the Editors of The Chemist.

Aberdeen, 3d April, 1841.

GENTLEMEN,—Perceiving that the attention of your readers has been called to this subject in a late number of your journal, may I be allowed to state to them the plan which has been found successful in this quarter, in lessening the grievance complained of by your Plymouth correspondent.

In February, 1839, in consequence of a memorial from their apprentices and assistants, a meeting of the chemists and druggists of Aberdeen was held to take into consideration the means which might be recommended for affording to the requisitionists an increased facility for mental cultivation and improvement; and amongst others the following resolutions were unanimously adopted;—

That on the evenings of every day, with the exception of Saturday, the shops should be closed exactly at 9 o'clock. That the shops should he opened in the summer quarter at 7 o'clock in the morning, in the winter at 8 o'clock, and during the spring and autumn at half-past 7 o'clock.

That all shops should be closed during divine service on the Lord's day.

With the view of giving the requisitionists an opportunity of employing their leisure hours to good advantage, their masters at the same time agreed to establish a library of books, principally on pharmacy and the collateral sciences—and to support it by an annual subscription of ten shillings each, and also a subscription of one guinea on the enrolment of every new apprentice.

These resolutions have now stood the test of two years. The society, which has so happy a beginning, is on the increase, and the library which the above subscriptions will every now and then continue to improve and enlarge, at present consists of upwards of two hundred volumes.

On the anniversary of these changes the members of the society dine together—and our occasional meetings have been the means of promoting great harmony and much good feeling amongst us. There is now little of the jealousy or want of confidence to which your correspondent refers,—and the public are so fully aware of our strict observance of the appointed hours, that no one requiring medicines will allow *nine o'clock* to pass by without sending for them. Let the druggists in Plymouth, and other places, who groan under the daily grievance of sixteen hours' shopkeeping, resolve to imitate the good example of their brethren in Aberdeen, and they may depend on it that the public will soon conform to the new state of things, and that they themselves will be none the worse, and their apprentices and assistants much the better, for the arrangement.

I remain, Gentlemen,
Your most obedient Servant,
"M. S. A. D. A."

MARKING INK REQUIRING NO PREPARATION.

To the Editors of The Chemist.

Maidstone, April, 1841.

Gentlemen,—I take the liberty of sending you this recipe for marking ink requiring no previous preparation, trusting that yon will think it worth insertion in your valuable periodical, which deserves the support of all.

Take ʒj of nitrate of silver, which dissolve in ʒvj of water. Add to this solution as much liquid ammonia as will re-dissolve the precipitated oxide, with sap-green to color it, and mucilage to make the quantity amount to one ounce. Traces written with this liquid must be instantly passed over a hot Italian iron, or held before the fire until they turn to a deep black.

I remain, yours respectfully,
A Retail Chemist.

BOOKS RECEIVED.

The Edinburgh Monthly Journal of Medical Science. Edited by John Rose Cormack, M.D., No. IV, April.

[This number contains, among other important papers, the first of a series of articles, hy Dr. Christison, entitled "Cases and Observations on Diahetes," to which we would particularly call the attention of our readers.]

Proceedings of the Meteorological Society, during the Session 1838-1839. Also—

A Table of MS. Scientific Papers in the Possession of the Meteorological Society, 20, Bedford Street, Covent Garden, up to the Anniversary Meeting, 1840.

A Table Descriptive of Meteorological Observations in the Possession of the above Society, April, 1840.

TO CORRESPONDENTS.

Oxygen.—The information received is correct only as regards the first four numbers.

A Reader of "The Chemist" is informed that the Electro-Galvanic Machine, for the purpose of Medical Galvanism, may he obtained at Mr. Clarke's, Philosophical Instrument Maker, near the Adelaide Gallery, Strand. The price of the machine is 2*l.*; and the Smee's battery to work it, 14*s.*

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

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THE CHEMIST.

I. CHEMISTRY.

ON THE COMBINATION OF HYDRATED SULPHURIC ACID WITH DEUTOXIDE OF NITROGEN, AND ON THE MEANS OF DETECTING IN THE SULPHURIC ACID OF COMMERCE THE PRESENCE OF NITRIC AND HYPONITRIC ACIDS, AND OF DEUTOXIDE OF NITROGEN.*

BY A. ROSE.

I. The sulphuric acid of commerce always contains more or less of an oxygenous compound of nitrogen, and, on this account, is colored of a red or black brown, when a solution of protosulphate of iron is thrown in. This action is commonly attributed to the presence of nitric acid, which it is said, is formed by the decomposition of the white crystals observed in the leaden chambers, or else by the direct oxidation of the hyponitric acid in these chambers. According to MM. Gaultier de Claubry and Henry, these white crystals contain sulphuric acid, hyponitric acid and water, and are decomposed, when dissolved in water, into sulphuric acid, nitric acid, and deutoxide of nitrogen, which is disengaged.

The quantity of nitric acid found in sulphuric acid, although inconsiderable, presents much inconvenience in the preparation of hydrochloric acid, for it always causes the formation of a certain quantity of chlorine which remains mixed with the latter acid.

In order to purify sulphuric from nitric acid, as well as from the sulphate of lead which it contains, it is generally submitted to distillation. In this respect I have followed the directions given in all works.† In distilling an acid which was powerfully colored by the protosulphate of iron, I changed the receiver, when a few ounces of liquid had passed over, expecting that it would contain water and nitric acid. But to my great surprise, I found that this part of the liquid, as well as the others, was quite free from nitric acid and all other oxidised compounds of nitrogen, while the residue contained more than before. This fact had already been observed by Barruel, and afterwards confirmed by Professor Wackenroder.‡ In another operation, in which I employed four pounds of the same acid, I obtained a similar result; the receivers contained one pound and a half of perfectly pure sulphuric acid.

II. I afterwards submitted to distillation a mixture, prepared on purpose, of four pounds of pure sulphuric acid, and four ounces of nitric acid of 1·4 density, frequently renewing the receiver. The three ounces which passed over first were very watery, and contained much nitric acid, and very little sulphuric; the next two or three ounces were almost exclusively composed of sulphuric acid, containing but little nitric; the next two ounces which were distilled contained only a trace of nitric acid. Then came a pound and some ounces of perfectly pure sulphuric acid. Finally there passed over an acid containing traces of an oxygenous compound of nitrogen; I then stopped the distillation.

The residue was yellowish, and disengaged deutoxide of nitrogen when mixed with water; this gas was converted into nitrous vapors in the air. In order to follow up this reaction, I introduced a certain quantity of the acid into an inverted eprouvette filled with distilled water; the vessel was filled with a colorless gas which became red in the air. It was, therefore, positively deutoxide of nitrogen. The residue acted generally, with reagents, like the solution of the *anhydrous sulphate of deutoxide of nitrogen*, described by H.

* *Poggendorff's Annalen*, vol. L.

† Geiger's *Pharmacie*, new edit. p. 273.—Mitscherlich's *Chemie*, p. 480.

‡ *Annalen der Pharm.* vol. xviii. p. 153.

Rose,* which led me to think that it might be an analogous compound. Experiment confirmed my opinion.

In order to be certain that the residue of the distillation really did contain deutoxide of nitrogen, and that it contained neither hyponitric nor nitric acid, I diluted half an ounce of it with sufficient water to drive off all the deutoxide of nitrogen. I then divided it into two parts: into one I poured a drop of nitric acid, and I then boiled both for the same time, namely, for a few minutes. The portion to which I had added the nitric acid, became deeply colored by the addition of a mixture of sulphuric acid and protosulphate of iron; the others, on the contrary, did not acquire any color. If the residue had contained hyponitric acid, the addition of water would have occasioned the formation of nitric acid, and the liquid, when boiled, would have presented the reaction of that acid. This process has always been successful in investigating whether sulphuric acid contained, in the state of combination, deutoxide of nitrogen, or hyponitric acid.

The protosulphate of iron is an excellent test for the slightest traces of deutoxide of nitrogen, and hyponitric and nitric acids; still it is always necessary, in testing for these bodies, to add to the liquid to be examined, a sufficient quantity of pure sulphuric acid, else this method is not strict.

It is easy to distinguish, in concentrated sulphuric acid, the deutoxide of nitrogen and hyponitric acid from the nitric acid; we have only to add a dilute solution of bichromate of potassa, for the deutoxide of nitrogen and hyponitric acid to convert the acid of that salt into protoxide of chromium, and to become nitric acid. The liquid then acquires a green color, only the solution of bichromate of potassa must be added drop by drop, because, otherwise, the green tint is hidden by an excess of the salt. As for the nitric acid, it cannot necessarily reduce the bichromate.

The employment of permanganate of potassa is not so advantageous in these reactions, because it is altered by powerful acids; however, it may be used if the sulphuric acid be previously diluted with about six parts of water. Indeed, make a mixture of sulphuric acid and pure distilled nitric acid, dilute this mixture with six parts of water, and add to it, when it has become quite cold, a few drops of permanganate of potassa, the latter will not be discolored. On the other hand, by diluting with six parts of water, the residue of the distillation of the sulphuric acid, which residue, in my opinion, is composed of a solution of sulphate of deutoxide of nitrogen in sulphuric acid, the solution of permanganate of potassa is discolored. When the diluted liquor is heated but for an instant, in the same manner as the mixture of sulphuric acid and protosulphate of iron detect in it the presence of deutoxide of nitrogen, it likewise discolors the solution of permanganate. But when the same liquid is heated for a longer time, the mixture of sulphuric acid and protosulphate of iron do not color it, and a few drops of a solution of permanganate of potassa are not discolored.

Professor Wackenrodert proposed to add to sulphuric acid, concentrated or diluted, a solution of deutosulphate of manganese; this salt is not discolored by the presence of nitric acid, but immediately by deutoxide of nitrogen and hyponitric acid; however, the solution of permanganate of potassa is a still more delicate test.

A portion of the residue arising from the distillation of the mixture of sulphuric and nitric acids, expressly prepared, was distilled in a retort heated by a lamp. I divided the first products which passed over, with a view of examining them. At first, sulphuric acid, containing very little deutoxide of nitrogen, came over. However, the quantity of the latter body increased in the succeeding portions. The second portion was a concentrated solution of sulphate of deutoxide of nitrogen in concentrated sulphuric acid, a solution which acts with reagents exactly like that of this combination in the same acid, as I shall show presently. There remained in the retort only a trace of sulphate of lead. The second portion was white, turned yellow on being heated, became green on the addition of water, then blue, and, finally, colorless by disengaging a quantity of deutoxide of nitrogen.

III. I have also tried to prepare in the direct way a compound of deutoxide of nitrogen and hydrated sulphuric acid.

When deutoxide of nitrogen, dried over chloride of calcium, is driven into concentrated and distilled sulphuric acid, contained in a spacious vessel, and not in contact with the air, the gas is rapidly absorbed if the current is not brisk, and no bubble escapes. In the contrary case, a certain quantity of gas passes through the liquid without being absorbed. When all the precautions are observed, a light crystalline deposit is produced, which attaches to the sides of the vessel, but which on being shaken, immediately disappears, being dissolved in the acid. If the current of gas be continued, the liquid acquires a lilac color, then a light blue, and, finally, a deep blue, without any perceptible increase of temperature.

* *Poggendorff's Annalen*, vol. xlvii. p. 605.

† *Annal. der Pharm.* vol. xviii. p. 154.

The liquid becomes thick, and acquires a syrupy consistence; by stirring, it is changed into a frothy mass, which again becomes blue and syrupy by repose. Finally, by prolonging the current of gas still further, the liquid is converted into a white, solid, and crystalline mass, which melts at a moderate heat, without decomposition, and solidifies *de novo* on cooling.

If the deutoxide of nitrogen were not dried before being driven into the sulphuric acid, the mixture would be slightly heated; however, the crystals appear to be formed quicker, which makes me think that steam favors their formation.

When water is added in successive portions to the crystalline mass, it disengages deutoxide of nitrogen, and there is produced, according to the quantity of water added, a green, blue, and, finally, colorless liquid. The crystalline mass dissolves without alteration in concentrated sulphuric acid, and when the solution is distilled, the excess of sulphuric acid first passes over, mixed with a little sulphate of deutoxide of nitrogen; and finally, the concentrated solution of that combination is sulphuric acid, which solution may be re-distilled several times without being decomposed. I have examined this solution, as well as the crystalline mass, to detect in it the presence of nitric and hyponitric acids, by following the method above indicated, but I found not a trace. To govern the reaction I likewise added, in the following experiments, a drop of nitric acid to half the dilute solution, and boiled both halves for the same time. The portion containing the nitric acid naturally gave a deep brown color, with the mixture of sulphuric acid and protosulphate of iron; the other did not change color.

The sulphate of deutoxide of nitrogen is decomposed by water as rapidly as the solution of the same body in sulphuric acid; however, when cold, the decomposition is not so complete. If the solution be diluted with a great quantity of water, and boiled for a long time, all the deutoxide of nitrogen is disengaged from it. The solution of permanganate of potassa is discolored by it as long as the mixture of sulphuric acid and proto-sulphate of iron detect in it the presence of an oxide of nitrogen.

IV. According to my experiments, the compound of anhydrous sulphuric acid and deutoxide of nitrogen, described by H. Rose, acts in the same manner. When diluted with water, the same shades of color are produced, and deutoxide of nitrogen is disengaged; if the diluted solution be boiled for a few minutes, all this gas escapes, and the mixture of sulphuric acid and protosulphate of iron indicates the absence of nitric acid. The sulphate of deutoxide of nitrogen is therefore more completely decomposed by the presence of hydrated sulphuric acid. When the crystalline mass is diluted with a great quantity of water, and heated for a few minutes without the addition of sulphuric acid, the solution is also colored, it is true, by the mixture of sulphuric acid and protosulphate of iron, but then the liquid when cooled, also discolors a weak solution of permanganate of potassa. When the latter is no more discolored by the liquor, boiled for some time, and cooled, no reaction is obtained with a solution of protosulphate of iron and sulphuric acid.

These crystals, then, act exactly like those which are produced in the manufacture of sulphuric acid, or those which are formed when hyponitric acid is passed into concentrated sulphuric acid. In the latter case, they are composed, as it is at present admitted, not of deutoxide of nitrogen, sulphuric acid and water, but of hyponitric acid, sulphuric acid, and water.

V. This identity of characters led me to prepare the latter crystals, with the view of ascertaining their composition.

For this purpose, I passed hyponitric acid into a spacious flask, containing an ounce of distilled sulphuric acid, and hermetically connected with a pneumatic trough. The hyponitric acid was produced by boiling a mixture of one part of fecula and 10 of nitric acid at 1·3 (according to Liebig's process). The air contained in the flask immediately took a deep-red color. The gas which was disengaged was collected: it consisted for the most part of carbonic acid,—a product which always accompanies hyponitric acid in the action of nitric acid on fecula. As, contrary to my expectation, no oxygen was disengaged, I discontinued the experiment at the expiration of half-an-hour; a yellowish-green liquid was formed.

This liquid disengaged much deutoxide of nitrogen when water was added. I kept it boiling thus diluted, both with and without the addition of sulphuric acid, replacing the water as it evaporated. However, for all that, the addition of the mixture of pure sulphuric acid and protosulphate of iron always occasioned in it a very deep brown color, while the solution of permanganate of potassa was not at all discolored by it.

The remainder of the liquid confined in a well-corked flask formed a mass at the end of a few hours. Very soon after it separated into two layers: the lower one was composed of white crystals, and the upper one, of a yellowish liquid, which I removed by decantation. I then dried the crystals by spreading them on a brick placed over a vessel containing sulphuric acid.

The decanted liquid contained sulphate of deutoxide of nitrogen in solution in sul-

phuric and nitric acids: diluted with a great quantity of water, and boiled, (the water being replaced as it evaporated), this liquid acquired a deep brown tint on the addition of a mixture of sulphuric acid and protosulphate of iron, while it did not discolor a dilute solution of permanganate of potassa.

The dried crystals, introduced into water, disengaged deutoxide of nitrogen, accompanied by the changes of color already mentioned; in a word, they acted like the sulphate of deutoxide of nitrogen, with this difference, however, that their aqueous solution, diluted and boiled, always contained traces of nitric acid: this minute quantity, however, evidently arose from the supernatant liquors from which it is difficult to entirely purify the crystals.

Hyponitric acid, in traversing sulphuric acid, appears to be decomposed into deutoxide of nitrogen and nitric acid; the former product combines with the sulphuric acid, while the nitric acid remains in great quantity in the supernatant liquor. It is thus explained why the crystals contain nitric acid, or nitrate of deutoxide of nitrogen.

VI. Finally, I have likewise prepared these same crystals by passing sulphurous acid and deutoxide of nitrogen into a large flask filled with air, and into which I could blow air by means of a glass tube. In presence of a little water and an excess of deutoxide of nitrogen, the crystals were immediately formed. As soon as they covered the lower sides of the flask, they appeared in the middle of that vessel under the form of snowy flocks. In contact with the air, they disengaged much deutoxide of nitrogen; their solution, boiled with sulphuric acid and water, then mixed with protosulphate of iron and sulphuric acid, showed no signs of the presence of nitric acid. Now, these signs would, of necessity, have presented themselves if the crystals had been composed of hyponitric acid, sulphuric acid and water. To ascertain it, I had divided the solution into two equal parts: to one I had added a trace of nitric acid, and then boiled it for a very long time: the reaction of the nitric acid was immediately manifested; the other portion gave none. I also took care to mix each solution, diluted, boiled and cooled, with a solution of permanganate of potassa, and this experiment showed me, beyond the possibility of doubt, that no nitric acid was formed by the addition of water, and that the crystals were composed, not of hyponitric and sulphuric acids, but of deutoxide of nitrogen, sulphuric acid and water.

If, on the contrary, atmospheric air be blown into the flask, when the operation is terminated and it still is full of deutoxide of nitrogen, so as to completely discolor the flask, there is found, it is true, in the solution, when boiled, a trace of nitric acid; but this evidently arises from the water contained in the flask having dissolved the hyponitric acid which is afterwards formed. I effected the actions in this case as in the preceding experiments.

VII. These are still the same crystals that are formed in the leaden chambers, and they should naturally be produced when there is an excess of deutoxide of nitrogen in relation to the atmospheric air and sulphurous acid; for, under these circumstances, only one part of deutoxide of nitrogen is converted into hyponitrous acid, which oxidizes the sulphurous acid, converting it into sulphuric, which immediately combines with the excess of deutoxide of nitrogen. Moreover, these crystals should also be formed in presence of an excess of hyponitric acid and atmospheric air, since the sulphuric which is at first formed, decomposes the hyponitric acid into deutoxide of azote, with which it combines, and into nitric acid. When it is desired to avoid the formation of crystals in the leaden chambers, care must be taken that the sulphurous acid is always in sufficient quantity.

I will present in a future memoir the analysis of these crystals as well as of those which we directly obtained by the deutoxide of nitrogen and sulphuric acid. This operation is subject to some difficulties.

VIII. The solution of sulphate of deutoxide of nitrogen in sulphuric acid acts with reagents like fuming and red nitric acid; so much so, that we are led to consider the latter acid as a solution of nitrate of deutoxide of nitrogen in nitric acid. In support of this opinion, I may mention this fact, observed by M. Gay-Lussac, that crystals are formed when red fuming nitric acid is mixed with fuming sulphuric acid. These crystals are without doubt sulphate of deutoxide of nitrogen.

When the sulphuric solution of sulphate of deutoxide of nitrogen is distilled, there first passes over, as I have already said, the excess of sulphuric acid, and afterwards the solution itself, in a concentrated state; this solution may be distilled several times without undergoing decomposition. It turned yellow by being heated when diluted with water, disengaged deutoxide of nitrogen, and took, according to the quantity of water added, a green or blue tint, which became colorless by a greater addition, as is the case with fuming nitric acid.

However, with water only, at the ordinary temperature, this solution, the same as fuming nitric acid, cannot be completely decomposed. The two solutions, even at the expiration of a very long time, always retain the property of discoloring the solution of permanganate of potassa. By heat-

ing, on the contrary, both lose their deutoxide of nitrogen; in fuming nitric acid, this occurs more rapidly. The two solutions may be made to contain that gas, by driving it into them.

Berzelius is of opinion, that fuming nitric acid may be regarded as a solution of a compound of deutoxide of nitrogen, with quite as much propriety as a solution of a combination of hyponitric with nitric acid, in an excess of the latter. The former opinion acquires more probability, when it is considered that an analogous compound exists with respect to sulphuric acid.

I likewise endeavoured to discover the cause of the sulphuric acid of commerce being so often impregnated with sulphate of deutoxide of nitrogen: the nitric acid in it is very rare.

With this view, I added to concentrated sulphuric acid sufficient water for the solution to have a density of 1·2. This is the ordinary density of the acid as it goes out of the leaden chambers. Moreover, I added to a portion of that acid, thus diluted, sulphate of deutoxide of nitrogen; to another portion, a solution of the same sulphate in sulphuric acid; to a third, pure sulphuric acid; and to a fourth, fuming nitric acid. I then heated each portion separately, in retorts, until sulphuric acid was distilled over; the residue always consisted of pure sulphuric acid. However, especially as regards nitric acid, I should have heated it until the remaining sulphuric acid had a density of 1·84. Even in mixing concentrated sulphuric acid with nitric acid, and in heating the mixture to a moderate heat, almost pure sulphuric acid was obtained as a residue. When the two pure and concentrated acids are mixed, so as not to become heated, and the mixtures left for several weeks, it does not appear to undergo any further decomposition; if very great quantities be rapidly mixed, a trace of sulphate of deutoxide of nitrogen is formed, the formation of which is necessarily owing to the increase of the heat of the mixture. If the latter be strongly heated in a retort, there is a decomposition; the neck of the retort is filled with vapour, and sulphuric acid charged with nitric acid is distilled over, then pure sulphuric acid; the residue then contains sulphuric acid holding in solution sulphate of deutoxide of nitrogen. If sulphuric acid be impregnated with organic matters, and if it be sought to discolor it by the addition of a few drops of nitric acid, it is always found that the sulphuric acid always then contains sulphate of deutoxide of nitrogen.

From this it is evident that the sulphuric acid of commerce ought to be free from every nitrous compound when it is of the density 1·84; but it is rarely found in that state of concentration. It can be impregnated with sulphate of deutoxide of nitrogen only when it has been discolored by nitric acid. Of late years, sulphuric acid has begun to be concentrated in platinum alembics, so arranged that the weak acid continually passes into that which is more concentrated: perhaps that is the cause of the deutoxide of nitrogen not being driven off.

Barruel proposed, for the purification of sulphuric acid, to heat it to 200° with sulphur, in order to destroy the nitrous acids, and afterwards to distil the sulphuric acid. But this manipulation is superfluous when the sulphuric acid is distilled; for then, even if it contain nitric acid, distillation always yields a pure acid. This product is pure, as I have already observed, even when a pound of sulphuric acid is mixed with an ounce of nitric—a proportion which certainly is not met with in commerce; only it is necessary, in this case, to change the receiver frequently. When sulphuric acid contains sulphate of deutoxide of nitrogen, pure acid immediately passes over.

In order to procure pure sulphuric acid before using it in the preparation of hydrochloric acid, it must first be mixed with two parts of water, that it may contain nitric acid, or sulphate of deutoxide of nitrogen: then the acid thus diluted is heated in a retort, until sulphuric vapour pass over. In this manner, there is also the additional advantage of this acid presenting a density of 1·85.

In the distillation of sulphuric acid, many precautions are recommended for avoiding the explosions which sometimes break the neck of the retort. However, if it be uniformly heated, all these precautions, and even the use of the platinum wire, will become useless, and I have constantly distilled sulphuric acid over the hare fire without having had to complain of such accidents. It is necessary that the neck of the retort be not too long, and that it should be as broad as possible: the receiver must not rest immediately on the neck, but must be separated from it by a platinum wire. The heat should be uniform: a charcoal fire is the best. The retort is filled to two-thirds, and, after being carefully placed on a small sand bath, it is strongly heated until vapors arise from the acid. The fire is afterwards lowered, and the acid is allowed to boil gently. It is kept in this state, uniformly heated, and care being taken that the boiling does not stop. If that should happen, the heat must be increased with great care, so that the acid may boil neither too suddenly nor too fast.

NITROCYNNAMIC ACID AND ITS SALTS.*

BY M. MITSCHERLICH.

M. MITSCHERLICH read to the Royal Academy of Sciences, Berlin, at its sitting of the 9th of December, 1840, a memoir on nitrocynnamic acid and its salts.

Nitrocynnamic acid is obtained by throwing pulverised cynnamic acid into concentrated nitric acid. For this purpose, nitric acid, which has been freed from nitrous acid by boiling, and which has been cooled as much as possible, is used. When but a small quantity of cynnamic acid is thrown in, it is at first completely dissolved; in a few minutes the liquor becomes hot, and a crystalline compound separates; the disengagement of heat lasts as long as this compound forms and separates. If one part of cynnamic acid he added to eight parts of nitric acid, the temperature of the mixture rises to 40° C.; none of the nitric acid seems to be decomposed: the nitrocynnamic acid which is separated forms a light and considerable mass of crystals, which absorbs the liquid like a sponge. When it is wished to prepare the liquid in great quantity, cynnamic acid and nitric acid, previously well cooled, in order that the temperature may not he raised above 60° C., are thoroughly mixed. As nitrocynnamic acid is nearly insoluble, water is poured on the mass, so as to wash away all the free nitric acid; it is then dissolved in boiling alcohol, from which nearly all of it separates on cooling; it is filtered, and washed with cold alcohol.

Nitrocynnamic acid is white, with a slight yellow reflection: the crystals are so small, that it is difficult to ascertain their form; it fuses at about 270° C., and becomes a crystalline mass on cooling; heated above 270, it hoils, and is decomposed. In cold water it is nearly insoluble; it is very soluble in hot water. On account of its insolubility in alcohol, it is easy to separate it from other acids which resemble it in properties. At 20° C. it is soluble in 327 parts of alcohol, whilst cynnamic acid is soluble in 4·2 parts, benzoïc acid in 1·96, and nitrohenzoïc acid in less than equal parts. Boiled with a little water, it does not form an oily liquid which collects at the hottom of the boiling saturated liquid, like benzoïc and nitrohenzoïc acids. It is not very soluble in hydrochloric acid, which does not decompose it.

With hases, it acts as a weak acid; carbonic acid displaces it. Its alkaline salts have a neutral reaction; they are very soluble, while the others are hut little or not at all so. The alkaline salts are obtained hy saturating the hase with the acid, and the other salts hy adding a neutral nitro-cynnamate, and in preference, the nitro-cynnamate of ammonia to the soluble salt of the base with which it is desired to combine the acid. The nitro-cynnamate of soda and that of potassa may he ohtained hy evaporating the solution into groups of crystals: the ammoniacal salt may he decomposed like the benzoate of ammonia; ammonia is disengaged, and the acid separates, hut not in very distinct crystals: the salts of potassa and soda do not undergo any alteration in the acid. Among the other salts, that of magnesia is the most soluhle. When an alkaline nitro-cynnamate is added to a dilute solution of a salt of magnesia, the magnesian salt is not immediately deposited; but, in a few minutes, groups of the new nitro-cynnamate are formed. The other salts are pulverulent precipitates; that of silver is very little soluble in water. The nitro-cynnamates detonate when heated, especially those of potassa and soda: if the salt of silver he heated with care, it is instantly decomposed, and so completely, that all the silver may be collected. These salts are decomposed by the powerful acids, which separate from them all the cynnamic acid.

When nitro-cynnamic acid is hoiled with 20 parts of alcohol, to which a little sulphuric acid has heen added, at the end of a few hours, provided the temperature does not exceed 80° C, the acid is completely dissolved. As the liquor cools, the ether separates in prismatic crystals, whose form it is difficult to characterise; by dissolving in alcohol to which a little ammonia is added, which does not decompose this ether, it is obtained perfectly pure. Boiled with a dilute solution of potassa, it yields nitrocynnamate of potassa and alcohol. This ether fuses at 136° C. and boils at 300° C. at which temperature it is decomposed. Cynnamic acid is distinguished from henzoic acid, hy giving, when distilled with dilute nitric acid, oil of hitter almonds, and also more easily hy the formation of nitro-cynnamic acid.

Burnt with oxide of copper, 0·5165 gram. gave 0·1695 gram. of water, and 1·0525 of carbonic acid without employing oxygen, and 0·299 gram. furnished 18·32 cubic centimetres of nitrogen at 0°, and at the pressure of 760mm, consequently, 100 parts of acid are composed of

Carbonic acid . . .	56·38
Hydrogen . . .	3·64
Nitrogen	7.73
Oxygen	32·24
	99·99

and if its formula is 18 C, 14 H, 2 N, 8 O, it should contain

* *L'Institut*, No. 378; March 25, 1841.

Carbonic acid . . .	56·34
Hydrogen . . .	3·58
Nitrogen . . .	7·25
Oxygen	32·78
	99·95

The analysis so nearly resembles the formula, that the composition may be regarded as accurate, and it may be considered as formed of one atom of nitric acid in combination with one atom of nitro-cynnamic acid, one atom of water being eliminated.

In order to determine the composition of the salts, the salt of silver was analysed: it was prepared by precipitation with neutral nitrate of silver and nitro-cynnamate of ammonia: when this salt has been dried at 100°, and heated to 140°—the point at which its decomposition commences, it does not give off water. The salt of silver analysed was dried at 120°; 1·0661 gram. of nitro-cynnamate of silver gave, when carefully decomposed, 0·3785 of silver; 1·8055 yielded 0·8757 of chloride of silver, and 1·2535 produced 0·590 of the same chloride. According to the first experiment, 100 parts contain 38·12 of oxide of silver; according to the second, 38·31, and according to the third, 38·11. From these investigations, it results that while the acid is combined with the silver, another proportion of water is separated, and that the acid combined with the base consists of 10 C, 12 H, 2 N, 7 O. By calculating the composition of nitro-cynnamate of silver according to this formula, it was found to contain 38·41 of oxide of silver, and 61·59 of acid.

The composition of the acid may be still better ascertained by analysing its ether, which may be obtained quite as easily as its salt of silver. 0·52375 gram. of ether gave 0·234 water and 1·13075 carbonic acid; 100 parts of this body therefore contain 59·74 carbonic acid, and 4·955 hydrogen; and if it consists of 18 C, 12 H, 2 N, 7 O + 4 C, 10 H, 1 O, we then have

Carbonic acid . . .	60·14
Hydrogen . . .	4·91
Nitrogen . . .	6·33
Oxygen	28·61
	99·99

Although the action of nitric acid on cynnamic acid has given rise to many experiments, nitro-cynnamic acid has not yet attracted much attention, because the temperature has been raised too high. Indeed, if more than one part of cynnamic acid be added to eight parts of nitric, the temperature rises beyond 60°, and when that temperature is exceeded the nitric acid is quickly decomposed, and an acid, first observed by M. Plantamour, is formed, whose composition has been investigated by MM. Marchand and Mulder, and whose salts M. Mulder has carefully studied. That chemist prepared this acid not only with cynnamic acid, but also with oil of cinnamon, and benzic acid. The crystallised acid consists, according to him, of 14 C 10 H 2 N 8 O, and, when combined with oxide of silver, of 14 C 8 H 2 N 7 O; it acts with respect to benzoïc acid, exactly like nitro-cynnamic acid. M. Mulder announced that nitro-benzoïc acid is formed by long boiling with a disengagement of nitrogen; but if nitric and benzoïc acids he heated together for a short time only, so as to disengage but little nitrous gas, the benzoïc acid is completely converted into the new acid, so that the disengagement of nitrous gas is owing to the reaction of the nitric acid on the nitro-benzoïc acid. The acid thus prepared, burnt by means of oxide of copper, gave results of similar composition to those announced by M. Mulder. A slight difference in the character of the salts, that of soda, for example, which may be obtained well crystallised, and which is not deliquescent, is perhaps owing to the dryness of our climate. This acid is evidently formed when nitric acid attacks the substances formed by the oxidation of benzoïc acid; but it is necessary to distinguish it from the acid obtained by the oxidation of oil of aniseed; this acid is not benzoïc acid, and does not contain nitrogen; it dissolves without decomposition in concentrated nitric acid, and combines with it, forming a new acid, a compound somewhat analogous to nitro-cynnamic and nitro-benzoïc acids. These acids were prepared last summer by M. Welzien, and are at present under investigation by him.*

M. Mulder gave the name of *nitro-benzic acid* to the acid which he discovered, because its composition is analogous to those of sulpho-benzic and nitro-cynnamic acids, and because it is formed in the same manner; but the name of nitro-benzoïc acid seems more correct. Cynnamic acid does not combine with sulphuric acid, like benzoïc acid; it is decomposed by it. If cynnamic acid be distilled with hydrate of lime, we do not obtain carburetted hydrogen and carbonate of lime, as with benzoic acid; this acid is decomposed into various products: there remains carbonic acid and carbon with the lime. The mass which results from it, submitted to distillation, leaves an abundant residue resembling pitch, and the liquid which has passed over has not an uniform boiling point, and in this respect resembles sweet oil of wine; it has the odour of benzine, but is distinguished from it in being fluid below 0°; probably it is a mixture containing benzine. Future investigations alone can determine whether the latter can give

* These same acids were also discovered and analysed in France, by M. Cahours.

another carburet of hydrogen besides that which chemists have procured from its combinations with sulphuric acid, which, according to their experiments, are composed in a manner analogous to the combinations of benzine with a hydrocarbon, which would be 16 C, 16 H. According to Croft's experiments, the oily substance which is obtained when camphor and oil of cinnamon are passed through a red-hot tube, would act as a product of distillation. The experiments hitherto made do not enable us to decide whether cynnamic acid analogous to benzoïc acid consists of a carburet of hydrogen and carbonic acid, or of benzine combined with another acid, which is probable. Indeed, the latter opinion is supported by the conversion of cynnamic acid into oil of bitter almonds by means of dilute nitric acid. Now this oil may be considered as composed of benzine and formic acid minus one atom of water, in which case only the portion of the compound arising from the acid would be oxidised, whilst that resulting from the benzine would remain unaltered.

Sulpho-benzoïc, nitro-benzoïc, and nitro-cynnamic acids, belong to the same group of compounds; it must be admitted that they are compounds of an inorganic and an organic acid. In the combinations containing nitric acid, there is one atom of each; in those which contain sulphuric acid, there is one atom of benzoïc acid, combined with two of sulphuric; it is an acid with a double atom. The capacity of these acids is determined by that of the inorganic acid; the organic acid is combined with the other without having any influence on the saturation, in the same way as fluoicsilic acid, fluor and silica unite with hydro fluoric acid, and as various bodies of organic origin, benzine, for instance, combine with those acids. This group clearly shows how each new atom which intervenes drives away an atom of water, so that it must be imagined that in the case where, for example, an atom of benzine and an atom of carbonic acid are in contact, an atom of water is driven off, and that when an atom of benzoïc acid and an atom of nitric acid also come in contact, an atom of the oxygen of the latter, and a double atom of the hydrogen of the benzine in the benzoïc acid are driven off under the form of water, so that a new acid results, which contains neither benzine, nor carbonic, nor nitric acid; but indeed the remaining atoms, and which have remained in the relative position which they previously occupied. In these three acids, the two acids which constitute them may in each of them have little mutual affinity, so at least we have a right to suppose, from the feeble development of heat at the time of their formation, while the quantity of heat liberated in a chemical combination may be taken as a measure of affinity. When sulphuric acid combines with benzoïc acid, or nitric acid with cynnamic, there is not so much heat disengaged as when an atom of sulphuric acid combines with an atom of water. Nevertheless, these compounds are not destroyed, either at the ordinary temperature, or by boiling solutions, with an excess of bases: they ought therefore to be considered as peculiar compounds, which have no analogy to those called inorganic.

ON NITRO-BROMO-PHENISIC AND AMPELIC ACIDS, ON CHLORO-PHENYLE AND CHLORALBINE, AND ON THE RELATIONS WHICH EXIST BETWEEN THE COMPOSITION OF SOME ORGANIC SUBSTANCES AND THEIR CRYSTALLINE FORM.—ON THE CRYSTALLINE FORM OF SOME COMPOUNDS OF THE PHENIC SERIES.

BY M. AUGUSTE LAURENT.

[The following is an abstract of two memoirs presented by M. Laurent to the Royal Academy of Sciences, Paris, at its sitting of the 5th of April, 1841.]

The first memoir contains the description of the following compounds:—

1st. *Nitro-bromo-phenisic acid* is a very well crystallised yellow body, which forms with bases very fine yellow, red, or orange salts, which are very analogous to the nitrophenesates and nitro-phenisates.

It is prepared by adding bromine to nitrophenisic acid. Its formula is

$$C^{24}H^{4}Br^{2}(A^{2}O^{4})^{2}O + Aq.$$

The anhydrous ammoniacal salt	. . nbPi + $H^{8}N^{2}O$.
The ammoniacal salt, dried at 100°C.	. . nbPi + $H^{8}N^{2}O$ + Aq.
The crystallised ammoniacal salt	. . nbPi + $H^{8}N^{2}O$ + 4 Aq.
The anhydrous salt of baryta	. . nbPi + BaO.
The red dried salt of baryta	. . nbPi + BaO + Aq.
The yellow crystallised salt of baryta	. . nbPi + BaO + 4 Aq.
The bibasic salt of lead	. . nbPi + 2PbO,
The crystallised bibasic salt of lead	. . nbPi + 2PbO + 2 Aq.
The $\frac{3}{4}$ basic salt of lead	. . 3nbPi + 4PbO.

* *Comptes Rendus;* No. 14, April 5, 1841.

Nitric acid acts on it in a very remarkable manner. The two atoms of bromine are replaced by one equivalent of hyponitric acid, and, consequently, nitro-phenisic acid is obtained.

2. *Chlorophenyle* is a body crystallised in golden yellow bracteæ. Its formula is

$$C^{16}\,H^{4}\,Cl^{4}\,O.$$

It is prepared by treating chlorophenisic acid with nitric acid. The former loses five equivalents of carbon and chlorine without decomposition.

3. The result of the action of nitric acid on bromo-phenisic acid is extremely singular; no bromo-phenyle is obtained, but nitrophenisic acid. Three equivalents of bromine have therefore been replaced by three equivalents of hyponitric acid.

4. Chloralbine is a body crystallised in white needles; it is volatile without decomposition, and is not altered by potassa. Its formula is

$$C^{24}\,H^{12}\,Cl^{4}$$

I conclude from this, taking its properties into account, that it is derived from a hydrocarbon, the formula of which should be

$$C^{24}\,H^{16}$$

It is found mixed with the chloro-phenisic acid prepared with oil of coal.

5. Ampelic acid is white and crystallised. Its formula is

$$C^{28}\,H^{10}\,O^{5} + Aq.$$

It is one of the products of the action of nitric acid on oil of coal.

In the second memoir, I show that all the following compounds are isomorphous:—

Nitro-phenesic acid . . .	$C^{24}\,H^{8}\,N^{4}\,O^{10}$
Nitro-phenisic acid . . .	$C^{24}\,H^{6}\,N^{6}\,O^{14}$
Chlorophenisic acid . . .	$C^{24}\,H^{6}\,Cl^{6}\,O^{2}$
Bromo-phenisic acid . . .	$C^{24}\,H^{6}\,Br^{5}\,O^{2}$
Nitro-phenesate of ammonia . .	$C^{24}\,H^{14}\,N^{6}\,O^{10}$
Nitro-phenisate of ammonia .	$C^{24}\,H^{12}\,N^{8}\,O^{14}$
Nitro-phenisate of potassium .	$C^{24}\,H^{4}\,N^{6}\,O^{14}\,K.$

The difference between the angles varies from 1° to 2°.

Nitro-bromo-phenisic acid is not isomorphous with the preceding compounds.

From this I draw the following conclusion (which is the same as that which I gave in my thesis published in 1837, and in a memoir that I presented to the Academy a year ago:)—

In general, when hydrogen is replaced by its equivalent of chlorine, bromine, oxygen, hyponitric acid, &c. the *formula* and the *form* of the new compound are similar to those of the old one.

But this law may be modified, first by dimorphism; secondly, by isomeria; and, thirdly, by a cause pointed out in my memoir.

In order that this law might become evident, the rough formulæ which have lately been introduced into science must necessarily be rejected, and it must be admitted that groups of compounds may act in compounds.

If equivalents be employed instead of atoms, and if hyponitric acid $N^{2}\,O^{4}$ be represented by X, the compounds of the series of phenyle will have the following formulæ:—

Phenic acid, or hydrate of phenyle .	$C^{12}\,H^{5}\,O + HO$
Chloro-phenesic acid . . .	$C^{12}\,H^{5}\,Cl^{2}\,O + HO$
Chloro-phenisic acid . . .	$C^{12}\,H^{2}\,Cl^{3}\,O + HO$
Bromo-phenisic acid . . .	$C^{12}\,H^{2}\,Br^{3}\,O + HO$
Nitro-phenesic acid . . .	$C^{12}\,H^{3}\,X^{2}\,O + HO$
Nitro-phenisic acid . . .	$C^{12}\,H^{2}\,X^{3}\,O + HO$
Nitro-bromo-phenisic acid . .	$C^{12}\,H^{2}\,Br\,X^{2}\,O + HO$
Nitro-phenesate of ammonium . .	$C^{12}\,H^{3}\,X^{2}\,O + Am\,O$
Nitro-phenisate of ammonium . .	$C^{12}\,H^{2}\,X^{3}\,O + Am\,O$
Nitro-phenisate of potassium . .	$C^{12}\,H^{2}\,X^{3}\,O + KO$

1. Chlorine is isomorphous with hydrogen;
2. ,, ,, ,, hyponitric acid;
3. ,, ,, ,, bromine (which was known before);
4. Hyponitric acid is isomorphous with hydrogen;
5. ,, ,, ,, ,, bromine;
6. Bromine is isomorphous with hydrogen;
7. Potassium ,, ,, hydrogen;
8. Ammonium ,, ,, hydrogen;

Or indeed—

Oxide of potassium . water;
Oxide of ammonium . water.

This isomorphism of ammonium with potassium and hydrogen proves, therefore, that in compound bodies groups of atoms can exist.

The isomorphism of hydrogen and chlorine with hyponitric acid proves the same thing.

ON A NEW ACID DERIVED FROM CAMPHOGEN.*

BY M. DELALANDE.

The name of camphogen was given by M. Dumas to the hydrocarbon derived from camphor by distilling it with anhydrous phosphoric acid. Having been able to prepare this body in greater quantity, and more easily than heretofore, I have subjected it to some investigations. The study of the action exerted by fuming sulphuric acid, which action is very clear and furnishes a new acid forming crystallised and well defined salts, will be the principal object of this note. I will commence by detailing the analysis that I made of the camphogen which I used in my experiments, as well as the determination of the density of the vapor, which had not yet been taken.

The camphogen which was analysed had been distilled five times over anhydrous phosphoric acid; its density was 0·860 at 13°.

Its boiling point was 175° C.

0·307 of the substance yielded 0·287 water, and 0·99 carbonic acid; whence—

Carbon . . .	90·04
Hydrogen . . .	10·30
	100·34

Calculation gives—

C^{40} . .	1530·40	90·3
H^{28} . .	174·72	9·7
	1705·12	100·0

The following are the details of the experiment for the determination of the density of the vapour:—

Excess of weight of the flask .	0·355
Volume of the flask . . .	153c.c.
Temperature of the bath in degrees of the air thermometer . .	190°C.
Air left in the flask . . .	2c.c.5
Temperature of the air . .	12°C.
Barometer	0·755
Weight of the litre . . .	6·21
Density	4·78
Calculation gives—	
40 vol. vapour of carbon . .	16·864
28 vol. hydrogen . . .	1·926
Calculated density . .	$\frac{18·790}{4}$ 4·697

When camphogen is heated in a sand-bath with a slight excess of fuming sulphuric acid, no sulphurous acid is disengaged; still there is a reaction: the camphogen is attacked and disappears, and a new acid is formed, as is easily ascertained by saturating the liquid with a carbonate of haryta or lead. The soluble salts thus produced easily crystallise on cooling after filtration, if a sufficiently weak solution be operated on. If the filtered liquid be too dilute, the crystallisation of the salt may easily be effected by evaporation in the sand-bath and cooling.

I call the new acid thus formed *sulpho-camphic acid.*

SULPHO-CAMPHATE OF LEAD.

This salt is obtained by saturating the sulphuric liquor, previously diluted, with carbonate of lead; it is evaporated. The crystallisation being effected, the first crystals may be dissolved in warm water, and recrystallised. The salt is presented under the form of pearly bracteæ. The following are the results of the analysis:—

0·4 of salt gave 0·168 water and 0·495 carbonic acid:

0·420 gave 0·180 sulphate of lead:

0·400, decomposed by carbonate of soda, yielded 0·271 sulphate of baryta.

Whence is deduced:—

Carbon . . .	34·2
Hydrogen . .	4·6
Sulphur . . .	9·4
Oxide of lead . .	31·8
Oxygen . . .	20·0
	100·0

These results agree with the formula $C^{40}\,H^{34}\,S^2\,O^9\,Pb\,O = C^{40}\,H^{26}\,S^2\,O^5, Pb\,O, 4\,H^2\,O$, admitting a constitution analogous to that of the sulpho-naphthalates. Indeed, we have:—

C^{40} . . .	1530·40	34·4
H^{34} . . .	212·16	4·5
S^2 . . .	402·32	9·0
O^9 . . .	900·00	20·7
Pb O . . .	1395·00	31·4
	4439·88	100·0

The desiccation of the salt was indispensable for confirming this view. It was most carefully effected in Liebig's apparatus.

1·796, dried at 120° C., lost 0·186 = 10·3 of water per cent. The salt was not altered. The loss indicated by theory, supposing four atoms of water to be expelled, is 10·1. Thus it may be admitted that sulpho-camphate of lead, dried at 120° C., is correctly represented by the formula $C^{40}\,H^{26}, S^2\,O^5, Pb\,O$. It therefore presents a composition analogous to that of the dried sulpho-naphthalates.

SULPHO-CAMPHATE OF BARYTA.

Its preparation is similar to that of sulpho-camphate of lead. It is also presented under the form of crystalline bracteæ.

This salt exerts a very singular action on the palate: the taste is at first a very

* *Annales de Chimie et de Physique.* March, 1841.

disagreeable bitter, but in one or two minutes it changes into a sweet taste, resembling that of Spanish liquorice: it is the same with the salt of lime.

0·4 of the crystallized salt yielded 0·353 water, and 0·961 carbonic acid. The analysis was made by adding an excess of oxide of antimony.

0·434 gave 0·173 sulphate of baryta, whence—

Carbon . .	36·0
Hydrogen . .	5·3
Baryta . .	26·1
Sulphur and oxygen .	32·6
	100·0

The formula $C^{40} H^{26} S^2 O^5$, Ba O, 4 H^2 O gives

C^{40}	.	1530·40	37·20
H^{34}	.	212·16	5·13
Ba O	.	1069·41	26·00
S^2	.	402·32	31·67
O^9	.	900·00	
		4114·29	100·00

Experiment and theory perfectly agree: the crystallized sulpho-camphate of baryta has, therefore, the same composition as the sulpho-camphate of lead.

SULPHO-CAMPHIC ACID.

Sulpho-camphic acid may be obtained by decomposing the sulpho-camphate of lead with sulphuretted hydrogen, and evaporating the solution *in vacuo;* it occurs under the form of small deliquescent crystals. I did not analyse it.

Camphene treated by fuming nitric acid with the aid of heat, is attacked and converted into a white solid matter, crystallising in nitric acid. This matter exhales a very sweet odour: it contains a large proportion of nitrogen. The study of this substance has not been sufficiently extended for me to give its true constitution.

NOTE RELATIVE TO THE PRECEDING ARTICLE.

BY MM. GERHARDT AND CAHOURS.

In the work on the *essence of cumin*, which we lately published, we described cymen, a hydrocarbon, $C^{40} H^{28} = 4$ vol. of vapour, which appears to us identical with the camphogen of M. Dumas, studied by M. Delalande. Since the publication of our Memoirs, we have had occasion to take the density of that hydro-carbon in the liquid state; we found 0·861 at 14°. M. Delalande found for camphogen 0·860 at 15°. The coincidence of the two densities is perfect. We likewise determined the boiling point of cymen by means of the same thermometer used by M. Delalande; we found it to be 175° C., that is the same degree as that at which camphogen boils.

Cymen and camphogen have therefore the same composition, the same density in the state of vapor and in the liquid state, the same boiling point, and the same chemical properties; we therefore consider them to be perfectly identical.

REMARKS ON ARSENIURETTED* HYDROGEN.

BY H. ROSE.

We ordinarily use, not only to detect the presence of arseniuretted hydrogen, but also to destroy the slightest traces of it, a solution of chloride of copper, in which this gas produces a yellow precipitate, which has a light brown reflection, and which is thus distinguished from the precipitate which phosphuretted hydrogen gives in this same solution of chloride of mercury. The composition of this precipitate is quite unknown. Stromeyer appears to be the only one who has yet studied it; and, according to him, arseniuretted hydrogen forms, with the mercurial chloride, arsenious acid, and a chloride of mercury, and an amalgam of mercury and arsenic. This precipitate is decomposed when kept under a great quantity of water: it becomes black, and consists only of bubbles and mercury. The supernatant liquor contains hydro-chloric and arsenious acids. This decomposition is exactly the same as that which water produces on the precipitate which is produced in a solution of chloride of mercury by phosphuretted hydrogen gas, and which separates into mercury, phosphoric and arsenious acids. Only this decomposition is more rapid than in the case of the precipitate by arseniuretted hydrogen. These two precipitates also act in the same manner with dilute nitric acid. At a gentle heat, they are converted into chloride of mercury, while the arsenic or the phosphorus is oxidized by the acid. This identity in the manner in which these compounds act with water and dilute nitric acid leads us to suspect a similar identity in their composition. Indeed, it is this that confirms the quantitative analysis, according to which this precipitate, produced by arseniuretted hydrogen in the solution of chloride of mercury, is represented by the formula— $As^2 Hg^3 + 3$ Hg Cl. The latter precipitate is distinguished in its composition from that produced by phosphuretted hydrogen in the chloride of mercury only in being anhydrous, while the other contains three atoms of water. This, no doubt, is the cause of their acting so differently under an elevation of temperature. That which contains phosphorus and chloride of mer-

* *L'Institut.* No. 380.

cury contains all the water necessary for converting the whole of the chlorine into hydrochloric acid, which, by means of heat, is disengaged in the gaseous form, and the phosphorus into phosphorous acid, which, by an elevation of temperature, is converted into phosphoric acid.

The precipitate formed by the arseniuretted hydrogen in the solution of mercury does not disengage, on the contrary, any gas by heat; but it is entirely sublimed, being decomposed into chloride of mercury and metallic arsenic. At the same time there is sublimed a small quantity of a reddish yellow substance, which consists of mercury, chlorine, and arsenic, and which is perhaps the substance itself, undecomposed. The sublimate often presents only a small quantity of mercury.

The composition of the precipitate which is obtained by the arseniuretted hydrogen in the solution of chloride of mercury, as well as the manner in which it acts with water, completely confirms the composition of this gas as given by MM. Dumas and Soubeiran.

The precipitate which antimoniuretted hydrogen produces in the solution of chloride of mercury has a composition analogous to that which arseniuretted and phosphuretted hydrogen give in that solution, whence it should be concluded that the composition of antimoniuretted hydrogen differs from that of arseniuretted and phosphuretted hydrogen.

ON THE SALTS OF BROMINE.*

BY M. RAMMELSBERG.

Since 1826, when M. Balard discovered bromine, that body has been the subject of many investigations. M. Balard himself has clearly and accurately explained the principal characteristics of this new elementary body. Other researches have also added to our knowledge concerning bromine, and Loewig in particular, profiting by the opportunity presented to him by the salt springs of Kreuznach, and having at his disposal great quantities of that body, has had his attention drawn to some of its properties. Nevertheless, it cannot be denied that some points of the history of this interesting body are deficient, and its combinations with oxygen in particular. For while the different compounds of this kind which chlorine and iodine form have long been known, bromine, which resembles them in properties, and in many respects should be classed with these two bodies, has presented, according to M. Balard, only one degree of oxidation, bromic acid; and furthermore, there exists but scanty and uncertain information concerning that acid itself, and concerning its combinations with bases, or the salts called bromates. Chemical works even go so far as to state that these salts have not yet been produced and studied.

Under such circumstances, it appeared to me very desirable to supply the deficiencies of M. Balard's work,—to examine whether there was not another degree of oxidation for bromine or perbromic acid, and to prepare all possible combinations of bromic acid with bases, and to study their properties and composition, and the manner in which they are acted on at a high temperature. I have at first endeavoured to explain as completely as possible the question of the existence of perbromic acid, and I then undertook a series of experiments on the bromates, which I have not yet completed.

Some subsequent experiments of M. Balard, made with the view of discovering hypobromic acid, proved that the disposition of bromine to combine with oxygen was in general extremely feeble. Bromic acid is always more easily decomposed than chloric acid, and cannot be compared with iodic acid in this respect. Although the chances of being able to obtain a higher degree of oxidation of bromine may not seem very favorable, it might be thought that this high degree, if it existed, would be, perhaps, more permanent, as regards chlorine, than the lower one. I therefore employed methods similar to those used for obtaining perchloric and periodic acids.

Bromate of potassa is immediately converted by heat, and after some very curious phenomena, into bromide of potassa; and it is impossible by means of chlorine gas, without elevation of temperature, and even with an excess of base, to produce a decomposition of its solution.

At about 120° C. bromic acid is decomposed into bromine and oxygen.

While the iodates of baryta, strontia, and lime are converted, as I have already demonstrated, by heat, into basic periodates, the corresponding compounds of bromic acid are reduced to metallic bromides.

Neither hypochloric nor permanganic acid peroxidize bromic acid. These different means, to which M. Balard has added many others, give rise to the formation of perbromic acid.

Among the bromates, I have studied those which have for bases potassa, soda, ammonia, baryta, strontia, lime, magnesia, the oxides of zinc, copper, lead, and silver, and the oxidule of magnesia. In this number, the bromate of ammonia is distinguished by the property of decomposing with violent detonation, not only with the aid of heat, but also spontaneously, at the end of a

* Read to the Academy of Sciences, Berlin, Dec. 7, 1840.

certain time, into bromine, nitrogen, and water; while oxygen is also probably liberated at the same time, or a formation of deutoxide of nitrogen occurs.

The bromates of potassa, soda, and silver are anhydrous. The first two crystallize in the form of regular systems; the last is a difficultly soluble pulverulent body. The bromates of baryta, strontia, lime, and lead contain one atom of water; that of baryta, by its insolubility, and that of lime, on the contrary, by its solubility, are difficult to obtain well crystallized. The two others are isomorphous. It is the same with the bromates of zinc and magnesia, both of which contain 6 atoms of water, and which crystallize in regular octohedra. The bromate of copper contains five atoms of water, that of oxidule of manganese is decomposed a few minutes after its preparation; the bromine becomes free, and the oxidule is deposited.

Several of these bromates combine with ammonia in the humid way. The bromates of copper and silver also take two equivalents, and that of zinc one equivalent of ammonia, besides three atoms of water.

These investigations have also made known a double salt, iodo-bromide of mercury, which may be found in the direct way, and which consists of an even number of atoms of these salts.

ON A FACT RELATIVE TO CHLOROMETRY.*

BY M. GAY-LUSSAC.

I HAVE the honor of communicating to the Academy, a fact which is of great interest in chlorometry, but the details of which I can give only in a memoir, which I hope soon to submit to it.

M. Caron, proprietor of a large bleaching establishment at Beauvais, had written to me that a solution of chloride of lime, of a known strength (100° for example), tried again the next day, and the day after, &c., successively increased in strength until 200°, and even to 400°. The experiment made in my laboratory was unsuccessful, but that was owing to M. Caron not having pointed out to me the circumstance essential to its success. This circumstance, which I was afterwards made acquainted with, consists in exposing the solution of chloride of lime to the solar light. Then tried with arsenious acid, it gave a strength which seemed to increase rapidly to double and even quadruple: but it was a false appearance. Chloride of lime or chlorite $ClO + CaO$, is converted by light into hypochlorate of lime, $ClO^4 + CaO$, which is no longer sensible to this immediate action of arsenious acid.† The nitrate of protoxide of mercury, on the contrary, acts in the same way on the two salts; that is to say, with the exception of a slight alteration of strength owing to another cause, it gives the same result with the chlorite and hypochlorite.

This remarkable conversion of chlorite of lime into hypochlorite, taking place only in the direct light of the sun and not in diffused light, does not diminish the confidence that we ought to have in arsenious acid as a certain agent in chlorometry.

NEW METHOD OF TESTING THE CHLORATES OF COMMERCE.‡

BY M. CHORON.

* * * "THE protoxide of lead, heated with chlorate of potassa in a glass tube closed at one end, gives puce oxide of lead (PbO^2), mixed with a small quantity of minium. On this new reaction is founded the test which I propose with relation to the chlorates. It consists in slowly heating to fusion an intimate mixture of the chlorate and litharge in suitable proportion, covering it with a layer of chloride of sodium; in treating the fused mass with dilute nitric acid; then in collecting on a filter the puce oxide obtained, by aid of which the quantity of chlorate employed may be approximately calculated.

"This prompt and cheap process appears to me sufficiently accurate to be employed in the arts."

ANDRAL AND GAVARRET'S PROCESS OF ANALYSING THE BLOOD.§

THE blood is received into two capsules of equal capacity, each capable of containing 180 grammes of water. In one of these the first and fourth quarters of the quantity of blood drawn are collected; this portion of blood is left to itself, to coagulate. In the other capsule, the second and third quarters are collected; this portion is immediately beaten up to obtain the fibrin, which is carefully washed. The two portions of blood thus separated, should have the same composition, whatever may be the influence of the flowing on the composition of the blood collected.

When the coagulation is effected, the serum is separated from the crassamentum, and we dry—

* *Comptes Rendus*, No. 15. April 12, 1841.

† It is perhaps the atomic mixture $ClO^3 + ClO^5$, which M. Millon says, was obtained by the direct action of hypochloric acid on bases.

‡ *Comptes Rendus*, No. 14. April 5, 1841.

§ *Journal de Chimie Médicale*, May, 1841.

1st. The fibrin obtained by beating up half of the blood.

2d. The serum.

3d. The fibrin.

The dry fibrin is weighed, and we thus know the quantity of fibrin contained in the crassamentum operated on.

When completely dry, the serum is weighed; and thus its composition in water and solid materials is known.

Finally, the dried crassamentum is weighed: the quantity of water contained in it, represented by the loss undergone during the operation of desiccation, permits the quantity of solid materials of the serum which the dried crassamentum contains to be calculated; subtracting from the weight of the dry crassamentum the weight of the fibrin, plus the weight of the solid materials of the serum which it contains, and which have been calculated, there remains the weight of the globules which the crassamentum contains.

The series of operation therefore furnishes:—

1st. The weight of the fibrin.

2d. The weight of the globules.

3d. The weight of the solid materials of the serum.

4th. The weight of the water.

When it is wished to separate the organic materials of the serum from its inorganic materials, after having completely dried that liquid, the residue is weighed in order to ascertain the quantity of solid products; then it is incinerated with great care in a platinum crucible. The white mass which remains at the bottom of the crucible, represents the inorganic materials.

SINGULAR EFFECTS OF LAUDANUM ON PAPER.

To the Editors of The Chemist.

Gentlemen,—In the month of June last, I placed a bottle, containing about 4 ounces of laudanum, among my books and papers, in one of my travelling trunks. A few days after, I proceeded on a long voyage, and the ship soon encountered some heavy "squalls" in the Gulf. Boxes, trunks, &c., went to "leeward," as is usual on such occasions; my bottle of laudanum was broken, and the surrounding articles were, of course, considerably stained with it. No further effect was, however, observed, until three or four months after, when I found that every book and paper that had been wetted with the tincture presented the appearance of having been singed, in a similar manner to what they would have done had they been exposed to the action of the fire. The depth of color and rottenness continued to increase daily, and at present some pieces are so rotten that they may be easily crumbled between the fingers. The paper appears to have nothing uuusual in its composition.

I should be happy to be informed whether the above effects of laudanum are to be ascribed to any of the principles of opium, or to other causes.

I am, Gentlemen,
Respectfully yours,
A. J. Cooley.

London, April 24, 1841.

II. CHEMICAL MANUFACTURES.

NEW PROCESS OF DYEING WOOL.

BY HERR KOEBU.

In the first instance I propose to use bi-chromate of potassa as the mordant for fixing the colors used in dyeing wool, in order to obtain more permanent tints and brighter colors, at less expense. According to my own experience, this salt renders colors more immovable in woolleu cloths than the mordants usually employed, such as sulphate of iron, or the double sulphate of alumina and potassa, or alum. The great affinity that bi-chromate of potassa possesses for woollen as well as for coloring substances, is the reason why a comparatively small quantity of that salt is requisite in order to make the woollen take the dye. I have found that 1 kilogramme of bi-chromate of potassa is equal to 3 or 4 kilogrammes of copperas or alum. Besides, the color produced by the salt of potassa offers a greater resistance to alkalies and to the air, as well as to the operations of rinsing and squeezing, to which woollen cloths are subjected in the process of the manufacture. Hence it follows, that smaller quantities of dyeing materials are requisite to produce a desired effect than are employed according to the usual process; because the dye adheres better, and there is less of the material taken away and lost in washing with soap. In fact, the fibres of the cloth are less injured when bi-chromate of potassa is used, than they have hitherto been by the acids contained in the alum and the copperas; on the contrary, the cloth becomes softer, is easier to rinse, to wash, and to press, and consequently the same quantity of wool produces more cloth of superior quality than

can be produced in any other way. I have also observed that hi-chromate of potassa is particularly successful in preparing the wool for the reception of certain dyes; especially for fixing logwood and fustic, whilst it has a less efficacious effect on red woods and madder.

As in my method of applying bi-chromate of potassa, all the dyes that are in general use are employed, as every shade or gradation of shade requires a proportionate difference in the ingredients, in short, as there is a very material difference in the qualities of the coloring materials used, to such a degree that douhle the quantity of one is requisite to produce a certain effect produced by another, it is almost impossible for me to determine the various proportions in which the hi-chromate should be used with each. It will be understood, also, that the weight of hi-chromate requisite varies according to the quantity of the dye which the wool receives; but in general I use 3 kilogrammes of hi-chromate of potassa to dye 100 kilogrammes of washed wool; I sometimes add to it 2 kilogrammes of tartar, and I boil the wool in the liquid produced by the solution of these salts, for an hour and a half. On the following day I apply the color bath prepared with the quantity of dye requisite to produce the shade that I wish to ohtain.

I also succeed in obtaining green colors quite capahle of resisting acids, alkalies, and exposure to the air, by dyeing the wool hlue when in fleece, in manufacturing the material thus dyed into half-dressed cloths, and then dyeing it yellow in the piece, in order to obtain a very permanent green, resembling in appearance a woollen stuff of dyed green, but much more permanent.

The mauner of dyeing yellow is too well known to require any description of it. Any kind of yellow dye may be used for this purpose, but I prefer fustic on account of its durahility. In this process, when the material which is half dyed has to be dipped in a bath of yellow dye, in order to fix the color, I make use of a solution of muriate of tin, to which I add a quantity of water necessary to give the fluid the specific gravity of 1·2612. I take from 6 to 7 kilogrammes of this solution for 100 kilogrammes of stuff, independently of the usual quantity of alum and tartar. This solution cannot be advantageously applied to spun wool which has not heen woven, hecause it would not admit of the use of soap, and consequently could not he pressed.

In the third place, I propose to use soda and hran, for dissolving the indigo in the vessels used for dying wool, in order to fix that coloring matter more effectively and at less expense than can he done hy the use of logwood, madder, and hran, that have hitherto heen generally adopted. The following is the manner and proportions in which I use soda to effect this ohject :—

Iu a vessel of the size of two metres, I heat the water to 50° C. I then throw into it 32 kilogrammes of hran, 17 kilogrammes of common soda, which contain about 23 per cent. of dry carbouate of soda, and 2 kilogrammes of indigo. I then proceed in the same manner as usual, adding to it the regular quantity of lime. Afterwards I hring the vessel to 43° and 48° C., three or four times a-day, without shaking it. In the evening I raise the temperature again to 50° C., adding 2 kilogrammes of lime, 3 kilogrammes of bran, and 2·5 kilogrammes of soda, with the quantity of indigo that I consider requisite. On the following day, and in the evening after this addition has heen made, I heat the bath in the usual manner, the temperature indicated heing ahove 50°C. If the bath has heen used during the day, I add every evening the quantities of lime, hrau, and soda necessary to preserve it in a proper state, even without adding indigo. My vessel being kept by this means in a state fit for use, I add from time to time, and in the evening, all the indigo to he used on the following day. It is impossible to define the quantity of this suhstauce that it is requisite to add in this manner, for it may vary from 250 grammes to 12 kilogrammes, according to the hue intended to be produced on the following day.

After having proceeded in the manner I have explained from eight to ten weeks, I do not empty my vessel, but I only take away the sediment that is formed; and with the liquid of the old bath I formed another hy the addition of 6·5 kilogrammes of bran and 5 kilogrammes of soda, with as much chalk and indigo as is necessary. As the chalk is intended to moderate the fermentatiou produced by the hran, it is impossihle to fix the quantity of this material that ought to he put in. I generally use the quantity that I consider necessary to limit the fermentation to the point when the indigo becomes simply deoxygenised and to stop immoderate fermentation, which would be injurious to the process. In making use of soda in my vessels the same rules and practices must he observed as with ordinary vessels, excepting that neither wood nor madder is used; nevertheless, the effect can he produced with wood, with madder and hran. I prefer using nothing hut bran with soda.

The hath into which I put the soda ought to he perfectly yellow, that is, the indigo should be entirely free from oxygen. When soda is made use of that contains 46 per cent. of dry carhonate, instead of common soda, only half the quantity is required to produce the same effect. Pearl-ash may also be used, if the price admits, and oatmeal instead of bran.

DISSOLVING VIEWS BY HYDRO-OXYGEN LIGHT.*

A remarkably pleasing and altogether new application of the powers of hydro-oxygen light is at present absorbing the attention of the visitors at the Royal Polytechnic Institution, where it was first exhibited on Easter Monday. The exhibition consists in displaying on the large disc in the theatre of the establishment a series of magnified pictures, properly called "dissolving views;" the effects of which are absolutely surprising to the last degree. What we ourselves saw we will endeavour to convey to the imagination of the reader by description. The first picture represented three line-of-battle ships, one English and two foreign, preparing for engagement. On a sudden, and by imperceptible means, the commencement of the action was indicated by the appearance of large volumes of smoke. These, in turn, were succeeded by a representation of the conquered foreign ships in a crippled state; their yards shot away, their rigging floating about, and the standard of England flying from the remaining stumps of masts. This accomplished, the vessels faded from the vision, their receding shadows giving place to a view of Greenwich Hospital from the river, with yachts and steam-boats at anchor. These changes are so nicely graduated that the eye scarcely recognises the illusory transformation. One of the most pleasing series of views was that in which were represented the old Royal Exchange, with its subsequent destruction by fire, the appearance of the ruins, and the (to be) new building. These changes were brought about as if by magic, the second taking the place of the first, as if it actually grew out of the canvass, for the purpose of displacing its successor. Altogether we saw eighteen of these metamorphoses. The effects we have alluded to are produced, not by mountebankism, but by science. Messrs. Cary, the celebrated opticians, are the inventors of this new and very charming application of the powers of a well-known chemical light; and their *modus operandi* is the result of philosophical principles.

APPLICATION OF ELECTRO-MAGNETISM TO MACHINERY.†

BY HERR STÖRER.

Leipsic, April 17.

THE meeting of our Polytechnic Society was rendered peculiarly interesting by a lecture given by Herr Störer on his experiments in the application of electro-magnetism as a motive power. Herr Störer commenced his experiments several years ago, before Wagner's invention, and has proceeded independent of it. By merely following up and carrying out the ideas of Jacobi, to whom the first merit of the discovery is due, he has succeeded in constructing a small machine, the power of which is as yet limited to the raising of only a moderate weight and putting a turning-lathe in motion, but which is, nevertheless, sufficient to render perfectly evident the whole mechanism of the important invention, and which, as the constructor observed, needs only to be enlarged to produce more practical effects.

The principle of electro-galvanic movement has its source, as is well known, in the law of reciprocal attraction and repulsion of two iron bars, surrounded by a galvanic current, alternating with positive and negative electricity, and thereby magnetized. Herr Störer's machine consists at present of only two concentric circles of spiral iron bars, surrounded by conducting wires for the reception of the electric current. Each circle contains twelve single bars, placed at the distance of from two and a half to three inches from each other, the bars of the outer circle being about half an inch separated from those of the inner. The outer circle is fixed; the inner forms the periphery of a moveable disc, swinging-wheel, or pinion. This mechanism is brought into connection by two conducting wires with a galvanic battery, in such a manner that in the first place the bars of the one circle with positive electricity surrounded those of the other with negative electricity; then suddenly, by an arrangement in the conducting apparatus, the current is changed, and thereby electricity of the like name is produced in both circles. The consequence of this operation is, that the opposite bars, in consequence of the different magnetic power communicated to them, first attract each other, then instantly becoming, by the inversion of their poles, similar magnets with equal force, repel each other. By this regularly repeated alternation of attraction and repulsion, each bar of the internal moveable circles in succession drawn towards all the bars of the external fixed circle, and then driven, as it were, back on the next, whereby the whole disc is brought into a state of uniform motion.

The inventor makes a very moderate estimate of the cost of the machine. The expense consists chiefly in the wear of the zinc in the galvanic battery by the action of the acid; but as to the outlay for this article, it will be almost entirely counterbalanced by the precipitate which in conse-

* *Morning Post.*

† From the Leipsic *Allgemeine Zeitung*, and *The Times.*

quence of the operation is formed in this acid, and which yields a somewhat valuable chemical product.

With regard to the power of the machine, and the possibility of reinforcing it so as to produce greater practical effects, Herr Störer submits the following considerations: —The present machine, though only double the size of the one first constructed, which had six pair of bars, acts with a six-fold increase of force. Each galvanic element consists of a copper cylinder, a zinc cylinder within it, and a chemical mixture by which they are connected. Now, as respects the effect of the number of elements employed, Herr Störer makes the following observations, the accuracy of which he has proved by experiments:—"In the connection with a single element, the machine raises, with moderate velocity, 3 lb.; with two elements, 13 lb.; with three, 25 lh.; with four, 40 lb. This is approximative by an ascending gradation of power in the ratio of 1, 4, 8, 12, whence it certainly would appear that the force might not he found to augment exactly in the relation of a progressive increase of the elements." According to Herr Störer's calculations, the connections of a battery of 50 elements, with a machine in cubical contents 26 times greater than the one exhibited, would produce an effect equivalent to 50 horse power.

Still, however, after all these data and calculations, there remain several doubts as to the practicability of the application of this invention to machinery on an extensive scale. On the other hand, the results obtained by the experiments hitherto made are of sufficient importance to encourage a spirited prosecution of the discovery, which is in itself so ingenious, that it ought to he joyfully hailed hy all who take an interest in the progress of civilization, as a new triumph of the human mind over inanimate matter. At all events, we Germans have just reason to be proud of an invention, the first idea of which came from a German, and all the improvements yet made in which are the offspring of German intellect and German perseverance.

ADULTERATION OF MOIST SUGAR.

BY CHARLES WATT.

Moist sugar has long heen the subject of various and infamous frauds aud adulterations, which are the more hase, as it is an article which is used chiefly hy the poor.

The most ordinary of the adulterations of sugar consists in increasing the weight of it by the addition of water, and hy the admixture of sand, and also hy a kind of sugar which is termed hy the sugar-refiners "hastards," in which there is very little saccharine property, but a large quantity of quite worthless mucilaginous matter. Of late, however, another adulteration of such a nature has heen introduced into it, and an article which is extensively used for this purpose, that it is difficult to say whether this kind of robbery on the public is most conspicuous for its baseness or its filth. We shall give a description of the substance and the manner in which it is ohtained, and then point out the best means of detecting its presence.

It is well known to our chemical readers, that when fats and oils are saponified—that is, when they have been boiled for some hours with an alkaline solution, or in contact with earths or metallic oxides—they become changed in their chemical properties, and a substance is developed, which, from its sweet taste, is termed *glycyrhine*."* This substance is yielded in great abundance in the process of soap-making; but as it is suffered to run to waste with the spent leys by the manufacturers, it is from another source that it is obtained for the purpose of being mixed with soft sugar, viz., from the manufacturers of steärine or moulded wax candles. That the whole process may be rendered the more intelligible, we will describe the manner in which this glycyrhine is formed, and which is the residuum or refuse left after making the oleïc and steäric acid.† The operation of forming steärine for candles is this: a quantity of tallow‡ is put into a wooden vessel, having a steam-pipe perforated with holes traversing the hottom of the vessel, in order to liberate the steam. Into this vessel ahout fifty or sixty pounds of slaked lime is put, and some water; the steam is then let on, and the vessel covered at the top, and the hoiling is kept up for ten or twelve hours. The tallow has now united with the lime, and is in a state of oleäte and steärate of that earth. The lime is to he saturated with sulphuric acid, hy being hoiled with it for some time. The steam is now stopped, and after allowing the oily matter to settle for some time, it floats, and the glycyrhine is at the hottom with the sulphate of lime,§ from which it is poured

* From the Greek words γλυκυς, sweet, and ριζα, a root.

† These are terms given hy their discoverer, Chevreul, to the oily and hard crystalline matters produced by the saponification of fats and oils.

‡ Mostly Russia tallow, which is generally so offensive iu odor, and so ahundant in filth and putrid matter, that the mere idea of it is loathsome.

§ Our husiness here is not to give a minute detail of the process of making steärine, hut

off, and any free sulphuric acid which it contains is carefully saturated by lime not in excess. The liquid is evaporated to the point when it assumes the appearance and consistence of sugar of about sevenpence per pound. It has a sweet taste; but it is needless to observe, that it is a worthless article, and obtained from a filthy and disgusting source. This is mixed with the sugar.

Now as the solubility of this substance in water does not differ from the sugar, it is not easy to separate them by an analysis; we would therefore advise persons, when they purchase sugar, in the first place to deal with the most respectable houses, and to choose that kind which has bright, shining crystals, resembling in size the red or coarse kind of sand. Generally speaking, sugar of a very small grain, of heavy, but dingy hue, crystalline appearance, is of bad quality, or of the "hastard" kind already mentioned. Sugar, on the contrary, which is mixed with glycyrhine is close, wet, and heavy, and has such a disposition to remain moist, that it clogs the sugar, and gives it the appearance of containing molasses. We think that our readers and the public will agree with us in the propriety of exposing such frauds as that we have related, and holding up their perpetrators to detestation.

From such atrocious cheats, not even the sacred obligations of religion are any protection; for we find that even among those who wear its outward garb, and are most assiduous and devout in their apparent duties, are equally, if not more guilty of them than the less sanctified portion of tradesmen. It seems so common a practice with them to adulterate every article in which they deal, that the following lines give a just view of their ordinary practice:—

"Have you sanded the sugar, good Sandy,
And watered the treacle with care;
Have you smuggled the element into the brandy?—
Yes, master.—Then come in to prayer."

ON THE MANUFACTURE OF SODA WATER.

BY MR. GRIFFITHS.

The object he had in view was to give a popular account of this beneficial liquid, which involves an acquaintance with both chemical and mechanical science. The materials required for its manufacture are pure water, carbonic acid gas, and carbonate of soda; which may be considered as the proximate elements of soda water. The ultimate elements are hydrogen, oxygen, carbon, and sodium.

Water was first considered.—It is never absolutely pure when found in nature. It may however be obtained in its purest form by the chemist *synthetically*, by mixing oxygen and hydrogen gases in the proper proportions, and passing an electrical spark through them in a Cavendish bottle, or other strong apparatus, as was first done by Sir H. Davy, in the laboratory of this institution. The process of distillation as invented by the alchemists is the mode employed to obtain water of sufficient purity for the purpose. The cheaper manufacturers do not however use it in this state, but are contented with drawing it from deep wells.

Carbonic Acid Gas has attracted considerable attention since the time of Dr. Black. It is principally procured by acting on carbonate of lime (marble, chalk, or whiting) with dilute sulphuric acid, when decomposition takes place: the sulphuric acid unites with the lime, and the carbonic acid passes off in the shape of gas. Water exerts a solvent power over it, giving to it a slight acid taste, and having the property of reddening vegetable blues, although but faintly. The gas is very soon dissipated from the fluid, even at the ordinary temperature of the atmosphere. This fugitive power of carbonic acid gas is further increased by beating.

Hales and Priestley discovered that by placing a vessel containing water into a jar containing carbonic acid, it imparted to the water a brisk and agreeable flavour; but it remained for Dr. Nooth to devise the means of obtaining it in a form suitable for a beverage. He constructed an apparatus composed of three vessels of glass, placed one above the other, and also in communication with each other, the upper two of which were filled with water, the gas as it is generated in the lower one, passes as fast as it is made through the water in the upper vessels, and is there partly absorbed. The superfluous gas is allowed to escape, and the impregnated water is drawn off as required. This apparatus was for some time to be seen on the side-board of dining rooms, and is occasionally met with at the present day.

In 1798, Mr. Pepys assisted Mr. Desvines in his experiments on the properties of carbonic acid gas and water, a description of which was given in the Philosophical Transactions of that year by the latter philosopher. Suffice it here to say, that the process is a very slow one. In 1800 Mr. Pepys con-

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a mere outline to enable our readers to understand the method of procuring the glycyrhine, or sweet matter of oils, as it was termed by Scheele.

* Lecture delivered at the Royal Institution, May 7, 1841, as given in the *Inventor's Advocate*.

structed an apparatus for condensing the gas in water, and in 1818 he obtained a strong aqueous infusion of carbonic acid by means of a machine, very similar to that now in use for the purpose. It consists of a vessel for generating the gas; this is connected by means of a tube to a condensing pump set in motion by a crank or fly-wheel, which pumps it into a glass vessel containing water, through a silver tube passing nearly to the bottom of the water. This glass vessel is enclosed in a copper vessel in case of accident. It is then drawn off and bottled; the bottles now used are the invention of Mr. Hamilton.

Further particulars may be obtained by referring to the 4th Vol. of the Quarterly Journal of Science and Art.

Soda Water of the best kind should contain a notable quantity of carbonate of soda; with the ordinary manufacturers this item is not attended to.

Mr. Griffith was indebted to Mr. Maugham for introducing him to Mr. Webb, of Islington, who has devoted nearly half of his life to the manufacture of soda water, and who kindly gave Mr. G. every information and access to his factory. There are, however, many hundreds of manufactories, but Mr. Webb's is considered to be on as large a scale as any. The ordinary manufacturers are contented with obtaining the water from deep wells and pumping carbonic acid into it. Mr. Webb has a machine for aërating the distilled or condensed water, which he uses; this together with the other apparatus cost between 3,000*l.* and 4,000*l.*, while the apparatus used by ordinary makers may be obtained for 70*l.* or 80*l.* The water made use of by Mr. Webb, is condensed by a ten-horse engine, and is pumped into a tank holding 4,600 gallons, to which carbonate of soda is added. It remains there for a fortnight before it is cold enough to work, and is then a weak solution of the carbonate of soda. This is then passed into a copper vessel, the interior of which is plated with silver, and is now ready for the reception of the gas, which is compressed into it by means of force pumps, the pressure being exerted until the valve indicates 70 lbs. on the square inch: it is then in a fit state for bottling.

The ordinary manufacturers formerly used to employ leaden vessels for the purpose; they now use slate of two inches thick for all the articles used in the process; even the gasometer, after the gas has been previously washed as recommended by Mr. Pepys, is constructed of slate.

Cleanliness is a leading feature in this manufacture, and in order to prevent the oil used to lubricate the pistons of the force-pumps giving a flavor to the water, they are washed in both the up and down stroke by a jet of water. In washing the bottles, a revolving bottle brush is used with steam power; they are again washed and set to drain. The corks demand the greatest attention, inasmuch as they are found to contain many impurities which would materially tend to render the beverage unsaleable. They are cleansed in the following manner:—

About 150 gross of corks are placed in a wooden trough containing water (at the temperature of 80° Fahr.) with fifteen pounds of carbonate of soda dissolved in it. They are pressed down by means of a board, and allowed to remain there for about twelve hours; this entirely removes the extractive dark brown matter from the corks, which is drawn off, and the corks are then dried by steam. If this operation were not performed the soda water would abstract the extractive matter of the cork, rendering the beverage both colored and unpalatable.

The occupation of the bottler is one of considerable danger. The bottles are corked through a brick wall, and he is, in addition, furnished with a thick leather apron padded in front about the chest. The face is protected by a wire mask, and the hands also are covered. The bottle is placed on a little stand, which rising by means of a lever to the tube, opens a valve. The cock is then turned, and the elasticity of the gas drives it into the bottle. He then has a cork handed to him by a boy, also similarly protected, which is put into the bottle, and is beaten in by means of a wooden flogger; this is the most dangerous part of the process. As soon as the cork is fairly in, the bottle is handed to a boy, who takes it in a piece of strong leather, and ties it down with string and wire. If the bottle be too thin to withstand the pressure, it bursts, and severely wounds the workmen, provided they are unprotected. The average quantity that break in one day at Mr. Webb's factory, when in full work is about twelve dozen. After it is corked, there is a pressure of about three atmospheres in the bottles.

He then alluded to the properties of carbonic acid in detail as connected with the subject, and explained the process of fermentation, &c. Towards the close of the lecture, *solid carbonic acid* was prepared, and mercury was frozen by mixing ether with it.

METHOD OF OBTAINING A PHOTOGENIC COPY OF A PRINT BY ONE EXPOSURE TO THE SUN.

BY T. W. NAYLOR.

It is well known that the ordinary photogenic fac-similes of an engraved print pos-

sess very little sharpness; the lights and shades appearing to mingle with each other, giving the whole picture a dull hazy appearance. This, it will he remembered, is principally owing to the second transferance, which is at present always practised, and which it is my object to dispense with altogether. After many trials and experiments, I at last hit upon the following method, which I have repeated a great number of times, and, to my satisfaction, it always fully answered my expectations.

The engraving of which you are desirous of obtaining photogenic copies is to be printed on thin paper, and instead of using the ordinary printing-ink, the following mixture must he used:

White wax . .	1 oz.
Canada halsam .	2 oz.
Copal varnish .	1 oz.

This is the composition I used, but any oily varnish will nearly answer the same purpose.

In order that the mixture may penetrate quite through the paper, the plate must he printed very hot and with a rather tighter pressure than usual. After it comes from the press, steep the impression several times in strong writing-ink until the parts untouched by the printing mixture appears totally impervious to the light. The appearance of the print is now very different from that of one ohtained hy the printer in the usual manner: the lines of the former being white and transparent, and the rest of the picture quite hlack and opaque, while those of the latter are hlack and on white paper as usual.

Having now possessed yourself of an impression prepared as above, you may obtain with the assistance of a sheet of photogenic paper, by only one exposure to the bright sunlight, an exact copy of the print, having the lines formed of the dark tint exactly the same as in an ordinary print. It must now he fixed in the usual manner, and the process is completed.*

Photogenic pictures, procured in the ahove manner, must necessarily possess great distinctness and clearness of outline, compared with those which have gone through the operation of re-transferring, which never fails to render them obscure and spiritless.

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* The prepared print will serve for an almost infinite number of times.

III. PHARMACY, &c.

MEDICAL REFORM AS RELATES TO DRUGGISTS.

We had hoped that the course adopted by the Committee of the Pharmaceutical Society lately established, hy which it is intended, that all who are about to he initiated into the business of chemists and druggists should receive a suitable education, and undergo an examination as to their qualifications, would have put an end to the eternal cackling of the apothecaries about the "invasion of their rights," by those whom they term "ignorant impostors and pretenders,"—*i. e.*, chemists. We are, however, satisfied that they are still at their work, hoth in private and in public, not only in scribhling in their *oracle*, but also in setting in motion the wonder-working association of old women who occasionally delight Exeter Hall with their oratory and wisdom.

Even from the very first exhibition of their intentions to ruin this large and respectable body, chemists had but little to fear; hut now they have nothing, so long as they use due vigilance, and do not rest satisfied until they have fully carried out the objects set forth in their prospectus, and which were proposed at the late meeting at the Crown and Anchor. No one can deny the necessity of "medical reform," *i. e.* medical improvement; still it is not to he ohtained hy depriving the chemist of the privileges which helong to his business; hut more especially hy preventing all apothecaries from exercising the art of surgery unless duly educated and qualified,—hy enforcing much severer study and more rigid examination in each distinct branch of science,—and hy suppressing quackery in all its forms, as well in the profession as out of it, hy far the largest portion existing there. Let only any one of common decency peruse the immoral, filthy, and disgusting advertisements which daily sully the minds of the youth of both sexes, with expressions too execrable for any other pen but that of the wretches who make the vices of man-

kind the subjects of their frauds.* The whole abandoned herd of Fadies, Gosses, Jordans, &c., have too long been suffered with impunity to carry on their lying and filthy abominations. It is to be hoped that not only the whole profession, but every well-wisher to the community, will exert his influence to put a finishing stroke to this nuisance. If patent medicines are to be suffered, in order to eke out the revenue, let such medicines be properly examined, and their composition duly specified and enrolled in the Patent Office, and let none but such be sold.

Of the many schemes of medical reform which we have seen, none are calculated either to give satisfaction or to put the different branches of the profession on a respectable basis. Each class has its particular views, and such as have come to our notice are most beautifully calculated to benefit that branch whence they originate, and to show that the old maxim of "taking care of number one" has been strictly adhered to.

It is our intention shortly to lay before our readers the present state of the medical profession as contrasted with what it ought to be: we shall then show that those corporate bodies who have hitherto been entrusted with the regulation of the different grades of practitioners, and the examination of their qualifications, have so neglected their duty, and studied merely to advance their own interests, that they have become a by-word of contempt to medical men and the public, and their colleges are now no more valued than the halls of the merchant tailors or of the fishmongers.

ADULTERATION OF CONFECTIO SENNÆ.

To the Editors of The Chemist.

Edinburgh, May 18, 1841.

GENTLEMEN:—

Aware of your anxious desire to expose the adulterations of drugs, which have lately become so very common, I would take the liberty to draw your attention and that of your readers to the usual mode of preparation followed to produce the confectio sennæ, than which there are few compounds better adapted (when properly made) for exhibition either of powerful medicines, or some of the milder and more gentle aperients. Few pharmaceutical preparations afford greater facility for the mixing of extraneous matter without the fear of detection than this one. Nay, from the composition of the electuary, it would be well nigh impossible, even by analysis, to detect its impurities; hence the only criterion by which we can judge of its purity is the effect produced upon the constitution. I have had occasion to draw your attention in a former instance to the subject of adulteration generally, and most sincerely do I hope that your own strenuous exertions to drag the hidden monster from his concealment may be crowned with success, and receive the thanks of every conscientious chemist in the United Kingdom.

In producing the spurious article, a little ingenuity is displayed in the endeavour to render it in appearance like the genuine. For this purpose various articles are employed; and for the sake of illustration, I will subjoin a formula, by which one of the largest provincial wholesale houses was in the habit of preparing the confect. sennæ,—and this I believe to be one of the best.

℞ Prunes and Figs, 4lb. Fruct Tamarind. 3lb. P. Fol. Sennæ, 2lb. P. Coriand. 1lb. Sacch. Alb. Com. 14ʒ. Ipecac. 16ʒ. Pulv. Jalapæ, ʒx.

But if proof were wanting regarding the impurity of confect. sennæ as usually sold, we have only to make a calculation of the absolute cost of the preparation, which we will find to come to somewhere about 1s. 9d. per lb., while many houses are vending what they have the hardihood to mark—"Conf. Sennæ. Ver." at 9d. per lb. My attention was strikingly drawn to this subject by a medical gentleman stating that there was very great difference in the effects of confect. sennæ, procured from various shops, upon the same individual.

The patient to which he referred was a female in delicate health, of a costive habit, but so delicate, that any medicine of a resinous description, brought on a violent attack of diarrhœa. He tried various remedies, but nothing answered so well as genuine conf. sennæ, and sometimes a little rhubarb. I have always attended particularly to this compound, but find that it has got not a little into disrepute, for which I think we have what are technically called the improvers to thank; who have devoted much time and labor to the reduction of quality and price. What, I would ask, can be more vexatious both to practitioner and patient, than to find the drastic effects from a resinous purge like jalap, taking the place of the mild and aperient character of the senna and other ingredients? Dr. Paris, in his Pharmacologia,

* We wonder that the Society for the Suppression of Vice does not interfere; it often does, where it is not wanted.

when speaking of the confectio sennæ, says—"the directions of the pharmacopœia are, however, rarely followed; jalap blackened with walnut liquor, is frequently substituted for the more expensive article cassia." And again, the same author states,—"I understand that a considerable quantity is also manufactured in Staffordshire, into which unsound and spoilt apples enter as a principal ingredient."

I need say no more to convince all who take an interest in the matter, for they have it in their power to test its virtues; but before closing this short epistle, I would impress upon the minds of my brethren in trade, the necessity of preparing, not only this but all other pharmaceutical substances which they possibly can. It may occupy more time, and be done at greater expense, but neither will be ultimately lost to them; for they may rest assured, that the time is now rapidly approaching, when the abusive system at present followed will be overthrown, and its votaries exposed. Adulteration is at its maximum, and we may safely calculate, now, that we have the prospect of the Chemists forming themselves into a corporate body to protect the hitherto neglected members of our trade, to find scientific and clever men starting up on what has long been considered as barren and unproductive soil.

I remain, Gentlemen,
Your most obedient servant,
J. M.

MEDICAL REFORM AS AFFECTS DRUGGISTS.

LETTER III.

To the Editors of The Chemist.

Gentlemen:—Whether the discussion of Medical Reform in the House of Commons will be brought on before the Corn-law measure, I must leave for politicians to decide. There is a question, however, which may be better answered by the readers of your journal; and the question is,—Are the chemists and druggists now exerting themselves in a ratio with the exigency of the times? When danger first appeared, and events assumed a threatening aspect, they all at once became alarmed, and in great haste called one another together; now that the danger is presumed to have past, the fear has subsided, and zeal is fast mouldering into indifference.

The energy and excitement of the druggists at the first meeting held at the Crown and Anchor Tavern was such, as to be the subject of much remark among the medical journals: nay, it had a mighty influence, as we know, upon the "reformers" themselves. The second meeting formed a singular contrast to the first, and was most remarkable for the zeal which was *not* displayed. The recommendation of the worthy and excellent chairman, at the opening of his speech, to preserve "calmness" in any debate which might ensue, was rather amusing, when compared with the subsequent feeling and tone of the meeting. Impetuosity certainly was not the order of the day; and I fear whether the "calmness" so faithfully preserved was not the result rather of apathy than of discretion.

Among those individuals with whom I have conversed, there seems to be an impression that medical reform will come to nothing, and therefore that nothing need be done on the part of the drug trade. Such sudden change from alarm to over-confidence, is not, I think, the part of a firm and prudent mind; and what grand assurance of security, with respect to the chemists and druggists will justify this sudden change? The seedling of "Medical Reform," although earthed over for a little while, by the dust of ministerial breezes, needs only a few genial showers, perhaps, to shoot into a sturdy plant. Then, as to the "views" of the government, (if still holding on) by way of opposition to the question, I do not know that much reliance can be placed upon that. Let those who have studied the movements of the weathercock in the month of March, calculate the phases of whig politics in the future tense. Mr. Hawes and his colleagues have been a good deal taunted by the newspaper press with presumption on the one hand, and fear and imbecility on the other. Lord J. Russell has also had the misfortune to be left in various disgraceful minorities. Is it quite certain that "Medical Reform," (like other legislative items) will be too large a price to pay for the purchase of some dozen or score of votes at a hard push?—of the votes of those men who are leagued to wage vehement war against the chemists and druggists?

Not very long ago the honorable Editor of The Lancet, was seen to be a virulent abuser and opponent of the ministry; so much so as to lead the usually meek and temperate Lord John Russell, into expressions of considerable warmth. Behold him now simpering to the noble Lord in all the *suaviter* of the sugar question—appealing to the medical public on the nutritive properties of sugar, and the philanthropy of relieving the poor man to the amount of six-tenths of a farthing per lb. duty on that useful commodity! Such incidents may be regarded only as straws; still, like straws thrown up, they serve to shew how the wind blows. Druggists may, perhaps, be captivated with the idea of an extra penny-worth of profit per gross on their lemonade and ginger-beer powders, or a penny per

lb. reduction on oxalic acid, and other manufactures of sugar; but would they be glad to pocket such enormous liberality if at the price of a "medical reform" monopoly? I mention this merely as a small matter for reflection, and to suggest that the eye of caution must be kept awake, as well as an unremitting activity exercised.

The first and grand point will be the efficient organization of the Society of Chemists and Druggists, called the Pharmaceutical Society. The committee, as I have once before stated, has very considerable claims upon the confidence and gratitude of the trade at large. It is composed chiefly of the wholesale druggists—men who have no direct advantage to themselves in the work in which they are engaged. Their exertions, I conceive, are honestly devoted to the general interest and welfare of the retail trade throughout the empire. For the latter, therefore, to withhold assistance and co-operation, under such circumstances, would be the extreme of supineness, stupidity, and ingratitude. It is by the suggestions they receive that the committee are mainly directed in framing such measures as may seem at present to be called for. No individual in the trade should imagine himself too insignificant to help, by his advice or counsel in such a matter, nor will any suggestion, I am confident, that may be offered, fail to be received with respect and kindness by the Committee.

The business of enrolment, which of course is the first thing to be done, has many impediments from the difficulty found by the committee in obtaining the names of chemists living in remote parts, in order to correspond with them. But fancy this difficulty increased by many not sparing the time, or having the inclination to forward their names for enrolment, after having been solicited so to do! I felt perfectly ashamed to hear many of the druggists at the last meeting refuse to put their names to the resolution for forming a pharmaceutical society, because "they did not know what they were going to sign!"

I would suggest that the Committee should appoint and announce some early day when they will publish the names of all those who have left or forwarded their names for enrolment.

I have also to propose, and would particularly recommend as a standing law of the Society, that no person should be eligible to enrol his name, or whose name being enrolled, eligible to remain a member, who makes it a part of his regular business *to visit patients out of doors;* and in the case of any member so visiting patients in time to come, that his name be forthwith struck from the rolls of the Society.

Such a regulation, I think, would not only be *practicable*, but would better define that line and barrier which has been sanctioned by custom, and seems marked out by the nature of things. And while it would show to the medical profession that the druggists are desirous of keeping up a due restriction and distinction between the drug trade and the profession of physic, it would imply, at the same time, that they will still reserve to themselves the right of practising whatever *they* consider to be proper, beneficial, and lawful, within their own house and castle.

I am, gentlemen, your obedient servant,

W. G.

MEETING OF DRUGGISTS AT WOLVERHAMPTON.

To the Editors of The Chemist.

Wolverhampton, May 14, 1841.

GENTLEMEN:—

I take the liberty of forwarding you a copy of the proceedings of our late meeting, and to request the insertion of the same in your valuable publication, "THE CHEMIST," hoping that this and other meetings, which have been held in various towns in England, may be the means of stirring up the members of the trade generally, to be alive to the necessity of co-operation in protecting their established privileges.

I remain, Gentlemen,

Your obedient servant,

J. F. SEYDE.

At a Meeting of the Chemists and Druggists of Wolverhampton, held at Mr. Fleeming's, High-Green, April 27, 1841, John Weaver, Esq., in the Chair, it was

First—Moved by Mr. J. F. Seyde, seconded by Mr. Gow, and resolved—

That the thanks of this meeting be given to the Committee of Chemists and Druggists in London, for their spirited and efficient opposition to the obnoxious bill of Mr. Hawes, which threatened interference with their existing privileges.

Second—Moved by Mr. Jackson, seconded by Mr. Ford, and resolved—

That a Committee be formed of the Chemists and Druggists in Wolverhampton, and that John Weaver, Esq., be requested to act as Chairman, and Mr. J. F. Seyde as Secretary.

Third—Moved by Mr. Fleeming, seconded by Mr. Griffiths, and resolved—

That a subscription be immediately entered into, and that a part of the amount be remitted to the Treasurer of the London Committee.

Fourth—Moved by Mr. Bailey, seconded by Mr. Alexander, and resolved—

That this meeting views with great satisfaction the proceedings of the London Committee, and pledges itself to co-operate with them in any measures they may adopt for the protection of the interests of the trade.

Fifth—Moved by Mr. H. Gibbons, seconded by Mr. W. H. Lowe, and resolved—

That this meeting, being of opinion that the Chemists and Druggists are capable of self-government, hails with pleasure the proposition of the London Committee for the formation of a society to be called the "Pharmaceutical Society of Great Britain," having for its object the union of the members of the trade into one body—the protection of their rights—and the improvement and advancement of scientific knowledge.

Sixth—Moved by Mr. R. Fowke, seconded by Mr. Banks, and resolved—

That the proceedings of this meeting be published in the two Wolverhampton papers, and forwarded by circular to the Druggists in the neighbourhood, requesting their co-operation.

Seventh—Moved by Mr. Sutton, seconded by Mr. Gorton, and resolved—

That the thanks of this meeting be given to the Chairman for his efficient services, to whom all communications are requested to be forwarded.

(Signed)

John Weaver, Chairman.

At the close of the meeting a subscription was entered into.

APOTHECARIES AND DISPENSING CHEMISTS.

To the Editors of The Chemist.

High-street, Bognor, 10th May, 1841.

Gentlemen:—Every well discerning man must retain a deep sense of gratitude towards the Metropolitan Committee of the chemists and druggists, for their unceasing exertions in the present struggle to cast off the yoke of oppression and fetters of prejudice and ignorance, which have hitherto been placed upon themselves and brethren by the several corporate bodies of medical practitioners, as also towards yourselves for the persevering and zealous course which you have pursued, in upholding and asserting the rights of the worthy members of our community, as well as discouraging and exposing the abuses and faults existing among others in their professional and scientific practice; at the same time, urging all, and the latter especially, to adopt such correct and creditably devised plan for their future line of conduct, as has already appeared in the columns of your valuable journal. Being impressed with this feeling, I am induced, after the encouragement you gave me by inserting my letter in No. 17, to write a few more lines, not only for the readers of *The Chemist* to consider upon, but every medical man also.

It has been a matter of surprise generally, I think, that so little notice should have been taken by the medical practitioners, of every department, relative to the clause in Mr. Hawes' Bill and according to Mr. Muntz, "that all prescriptions be written in English, and that all bottles, &c. be labelled in a similar manner." Is not every prescriber of medicine on the *qui vive*, as to whether such an *absurdity* will ever become a law? Would that the minds and talents of the many gentlemen composing the different bodies, were neither misdirected, nor misapplied, and that, instead of viewing one another with envious and avaricious eyes, they studied to assist and uphold each other, in their several positions in life, thereby gaining the respect, confidence, and support of the public, and being enabled to oppose *effectually* that, which, if once allowed to come into operation, will too surely be a death-blow to the physicians, and a ruin to the profession "in toto." I trust that so deplorable a state of things may *not* be allowed to continue much longer; that all may be alive to their own interests, perceiving that in *unity* lies their *strength* and power to crush, at their very birth, these trumpery abuses which are now being introduced.

If not out of place, I will mention a fact, showing the *erroneous* ideas entertained by these gentlemen, which can only create a feeling of pity and regret that they should be so blinded by prejudice, and a laugh at the thought of their holding up a picture intended as a representation of ourselves, and which, when reason approaches, is clearly proved to be no more than a mirror, in which themselves are faithfully depicted. A surgeon, a friend of mine, after reviling your publication, *The Chemist*, in a letter, proceeds thus: "I signed a petition, praying the extermination of such vipers, as the chemist and druggist. How could the Government or the public allow themselves to be hamboozled so long? A friend of mine, in the same profession as myself, visited the chamber of sickness, in which a lovely relict of what had once been most lovely lay: she had been accustomed to seek the advice of a reptile (druggist), whose kind attention had brought her to the state she was then in. The slightest examination of the medicine was sufficient to show him the dreadful effects of drugs, when applied by inexperienced hands. I need not add that skill

soon snatched her from the yawning gulph of death to which ignorance had brought her. How can these things he suffered to exist? How can the eyes of the poor be suffered to remain hlinded hy ingenious imposition, more cunning than priestcraft, and more fatal to disease, than neglect itself?" I would only kindly remind my friend, should this meet his eye, in the words of Lord Bacon, that, "discretion in speech is more than eloquence."

At the present time, if a chemist and druggist attends a patient, and a second opinion is required, what follows? The "man of knowledge" does not think what he would have done in the chemist's place, but often gains a first knowledge of the disease himself from the prior treatment of the case, which perhaps enables him to restore the patient, and consequently gains him credit for heing very clever. Such is the real truth; but put any question, and he assured you will meet with a reply similar to the words above quoted. Again, suppose a patient dies under the hands of a chemist and druggist, what is the result? A strict investigation is absolutely necessary; but, I say, reverse it, and let it he a medical practitioner's case. Is it asked under what circumstances the person died,—whether proper remedies were applied,—if the nature of the complaint, or the effects of the medicines administered were properly understood? Certainly not,—because they have licences to protect them, and their fellow members' support. Let *us* become a corporate body of ourselves, having examinations and licences, with a discriminating and impartial public for our judges; then shall we fear *none*, knowing that each will find his own level, that the intellectual and scientific man will he acknowledged and supported by all, and that he who carries his hrains in his pocket, will be treated and looked upon as *such*. By inserting this in your valuable journal, if worthy, you will oblige, Gentlemen,

Yours, very respectfully,

Alfred Watts.

PRESCRIPTION WRITING.

To the Editors of The Chemist.

Gentlemen:—

In your remarks on Medical Reform, in No. XVI. of The Chemist, speaking of Physicians, you ohserve that—"it is to be regretted, that instead of writing prescriptions in the very worst Latin, they are not contented with plain English." I must say, I do not entirely agree with you; I am quite sure, that in many instances the mind is the great ruling influence, and that a prescription written in English would be suhjected to a canvass hy the patient, in niue cases out of ten to a disadvantage, as, not knowing how simple a remedy is frequently of the greatest service, they would be led to despise the means of cure; but I do think that the general illegihility and the striving after the scientific names are evils to he complained of and which ought to he remedied. I really think, with all due reference to the Faculty, that among other studies, the art of writing in a plain legihle style should not be neglected; many prescriptions that have come in my way in the last twenty-five years, have been merely guess work.

I am, Gentlemen,

Your constant Reader,

A Chemist and Druggist,

A. Z.

HOMŒOPATHY.—REPLY TO MR. YOUNG.

by mr. p. h. harper.

To the Editors of The Chemist.

Henley in Arden, May 14, 1841.

Gentlemen:—I should he obliged by your inserting the following few remarks in answer to Mr. Young's last paper on Homœopathy, in the following number of your excellent journal. They are the last I shall trouhle you with on that suhject.

I am, Gentlemen,

Your ohedient servant,

P. H. Harper.

It is very evident that Mr. Young has studied his favourite science of homœopathy to the exclusion of every other branch of medicine. Not know what Brownism is! Not know that his principles made quite as much noise in the medical world at the time they were first promulgated as homœopathy is at present doing. Mr. Young evidently is very ignorant of the first principles of medicine, and of every revolution that has taken place in the general principles of medicine.

Does Mr. Young think that hecause certain proselytes to any science are able to write M.D. or M.R.C.S. after their names, it increases the value of that science, or converts any greater number of self-thinking men to its dogmatical tenets? I can assure him, No.

With respect to the effect of medicines on the healthy suhject: Andral took quinine in the doses recommended hy Hahnemann for the time recommended hy him, and with every care, attention to, and strict observance of the regimen likewise directed hy him, and yet never was able to induce symptoms resembling ague. Was Andral hlessed with a happy idiosyncracy against that disease? What says Mr. Young?

It is still more evident that Mr. Young knows nothing of the doctrine of allopathy, or else he would know that there is such a disease as spontaneous salivation, and therefore whatever honour he may wish to give me for having described some new disease, I will freely give it him all back again, and assure him that I have only described a disease which every practitioner sees almost daily. Mr. Young next wishes to know why I do not embrace homœopathy? What! am I to prostrate my reason and my judgment to the shrine of demonstrably absurd doctrines, and in spite of every sense of reason or of feeling, try experiments on the health and lives of my fellow-men? Am I to give the decillionth of a grain of arsenic in peritonitis? Am I to give cantharides in inflammation of the neck of the bladder? Am I to give mercury in spontaneous salivation? Eh, Mr. Young? "God help," say I, "those patients getting under such a mode of treatment."

With respect to the development of electricity in their minute globules, I again say, that it is impossible that it can be retained even were it developed; but it is impossible that it can be developed during the amount of trituration given in preparing their medicines. Hear what Hahnemann himself says as to the amount of trituration required: "I have been forced to prescribe the number of shakes to two, of which I formerly described ten in each dilution;" (Organ.) And in dissolving a solid in water, we are told to move the phial "*circa axin suum*," and at each alternation to shake it twice, "*bis, brachio quidem bis moto, concute.*"* Therefore I say it is impossible to develope electricity in such minute shakes. With respect to its curing disease, I said before, and say again, that it is only capable of curing those diseases which would get well equally fast if left to themselves.

Perhaps Mr. Young does not know that homœopathy was fairly put to the test of experiment by some of the members of the Académie de Medécine, and that the result was a failure, and that one of the first pathologists in Europe (Andral) tried it on 130 or 140 patients, taken without any choice or care from the wards of the hospital, in the presence of the homœopathists themselves, and treated with every possible regard to the homœopathic regimen and medicine, and yet not in one case was he successful.

Finally: let me say, I have only come to the conclusions mentioned in this and my former paper, in consequence of finding every portion of this doctrine so absurd and so untenable, as well as altogether inconclusive as to its own professed end.

I am, Gentlemen,
Your obedient servant,
P. H. Harper.

* See Dr. Quin's *Pharmacopœia Homœopathica.*

EXPERIMENTS ON POISONING BY ARSENIC: MADE BEFORE THE ROYAL ACADEMY OF MEDICINE, PARIS.

BY M. ORFILA.

(*Concluded from No. XVII.*)

FOURTH SITTING; NOVEMBER 2, 1840.

The sitting commenced at ten o'clock.

The minutes of the last sitting having been read by M. Orfila, and having been pronounced correct, were signed by the members of the commission.

The two dogs poisoned on the 28th of October—one by ten centigrammes of arsenious acid, and the other, by the same quantity of stibial tartar, were taken; both animals, as we said in our last, had made water in a considerable quantity, and were cured. About 130 grammes of urine were obtained from the dog that had been poisoned by arsenic, and 40 grammes from the other. These two liquids were evaporated in two new porcelain capsules, after having been mixed with ten centigrammes of alcoholate of potassa; the dried product was torrified, at a moderate heat, being kept stirred until it acquired the color of burnt coffee. The residue furnished by the urine of the dog poisoned by arsenic was boiled in distilled water for ten minutes, and that from the dog poisoned by tartar emetic was boiled for a quarter of an hour in pure concentrated hydrochloric acid. The two liquids being filtered and introduced into two of Marsh's apparatus, previously tested, one furnished arsenical, and the other antimonial stains.

The urine of the dog poisoned by arsenic, and collected on the 31st of October, four days after the poisoning, subjected to the same operation, also gave arsenic. The urine which had been passed by the dog poisoned by tartaric emetic on the 29th of October, the day after the poisoning, treated in the same way, immediately yielded antimony. The liver of these animals, dried, and carbonised by pure concentrated nitric acid, left two carbons which were boiled for twenty-five minutes with distilled water: the filtered liquids, put into two of Marsh's apparatus, gave no traces of either arsenic or antimony, even after a trial of half an hour.

About 120 grammes of urine passed on the 1st of November, by a woman labouring under cutaneous disease, attended by Dr. Emery, were subjected to the same chemical operations, and arsenical stains were imme-

diately obtained. This woman took every day, for more than six weeks, very small doses of Fowler's drops, a compound of potassa and arsenious acid. Antimony was obtained by the same means from two samples of urine sent by Dr. Bouvier, passed by a woman labouring under pneumonia, to whom that physician has administered at one time 20, and at another, 30 centigrammes of stibial tartar.

"It is the same, therefore, with man as with animals," said M. Orfila. "You see that in both cases, the arsenical and antimonial matters, introduced into the stomach, are eliminated with the urine. We have already proved this fact on the urine of several patients attended by MM. Dumeril, Hassen and Bouvier. We have also seen that the liver of two persons who died after the administration of two strong doses of emetic, contained appreciable quantities of antimony.

"I would most seriously call the attention of the meeting to the medico-legal consequences which flow from these facts. The experiments which you have witnessed incontrovertibly prove that if we had hung the two dogs poisoned on the 28th of October a few hours, or a few days, after the poisoning, we might have extracted arsenic and antimony from the liver and other viscera of those animals. Now, on the sixth day after the poisoning, we cannot detect an atom of either of those metals in the above-named viscera, but the urine passed by those animals from the 28th until to-day contains arsenic and antimony. It might happen, therefore, that an individual might die poisoned by one or other of these poisons, and that they would not be detected in the liver, the spleen, the heart, &c., because the person had lived several days after the poisoning, and because all that had been absorbed had been eliminated by the urine, and perhaps by other ways. You see how one might be deceived, if one said that the two dogs to whose thighs the arsenious acid and stibial tartar had been applied, on the 28th of October, had not been poisoned, because only six days after the poisoning, the existence of arsenic and antimony was not detected in the liver, spleen, &c. ! ! ! I do not mean to say that the organs always are freed, on the sixth day, from the absorbed poisons; for there are great differences, according to constitutions, the dose of the poison, and the quantity of urine passed in the first days of the poisoning."

M. Orfila then showed the two dogs whose œsophagus had been tied on the 29th of October, and which was perfectly cured. Of the five animals poisoned the evening before by 25 centigrammes of arsenious acid dissolved in water, by 50 centigrammes and by 1 gramme of the same poison pulverised, 4 had completely recovered. The fifth, which was very well three hours after being poisoned, died on the spot at one o'clock the day before, because the warm water with which he was injected, instead of going into the stomach, went into the tracheal artery; death occurred from suffocation, as shown on opening the body in the presence of the members of the commission. The four dogs which were cured vomited several times, and were treated only by warm water, except two, which were bled at half-past one. One lost 125 grammes of blood, and the other 270.

The dog to which the tonic excitant medicine was administered at half-past ten o'clock yesterday morning, died at half-past six o'clock in the afternoon.

At a quarter-past ten, 25 centigrammes of arsenious acid were introduced into the stomach of two dogs, and the œsophagus was tied. At a quarter-past eleven, the ligature was detached: a mixture of 128 grammes of broth, 32 grammes of brandy, as much wine, and 15 drops of Sydenham's laudanum, was injected. This injection was repeated at one o'clock, at three, and at half-past five. One of these animals died at six o'clock, although it had vomited considerably since noon; the other died at a quarter-past seven; the latter was very robust, and much stronger than the other.

These experiments, said M. Orfila, naturally lead me to speak of the treatment of poisoning by arsenical preparations.

After some considerations on the manner in which poisons act, M. Orfila said that a physician called in to a case of poisoning should commence by evacuating the patient both upwards and downwards, in order to remove from the digestive canal the portion of poison which has not yet acted: if this were not done, it would exert a prejudicial action, and every minute the symptoms would be aggravated. Warm water, emetics, and mild purgatives, almost always are successful. With certain poisons, such as those which may be instantly decomposed in the digestive canal, being converted into an insoluble and inert matter, antidotes and counterpoisons are employed with advantage, emetics and purgatives being afterwards used for removing the poison which has not been decomposed, and also that which has. Thus, in cases of poisoning by the salts of lead or baryta, a few grammes of sulphate of potassa or soda, taken into the stomach, are sufficient to immediately convert those poisons into sulphate of lead or baryta, both of which are insoluble and inert. In certain cases, recourse is had to liquids, which possesses the property at once of neutralizing the poisonous substance, and of expelling it from the diges-

tive canal, such as white of egg in warm water, in cases of poisoning by the salts of mercury and copper (corrosive sublimate, verdigris).

However, we must not stop here: part of the poison swallowed is already absorbed and carried with the blood into the different organs: it is this portion that occasions such fatality, and unfortunately emetics and purgatives have not the power of expelling it, not having any hold over them. This portion causes a more or less serious disease, which must be attacked without delay, sometimes by bleeding and emollients, if it is inflammatory; sometimes by narcotics, sometimes by excitants, and, in my opinion, most frequently by diuretics, combined with one or other of the means of which I speak. Let us dwell for a moment on the advantages of diuretic treatment.

It has been proved that in most cases the poisonous substance is absorbed, and passed into all the fibres of the body, where it remains for a long time, and from which it is expelled, if not entirely, at least in considerable quantity, by the urine. Common sense points out that it is useful to promote the secretion of urine, in order to remove, continually, and in small quantities, the poisonous substance from the fibres, which ultimately kills the patient, unless the physician masters it. Now, the very numerous experiments tried on animals confirm the justice of this reasoning, by proving that all the dogs which were poisoned by sufficient quantities of arsenious acid and tartar emetic to have killed them in from 20 to 40 hours, were quickly cured, if made to pass urine freely, by means of a diuretic composed of five quarts of water, a quart of white wine, a bottle of selzer water, and from 60 to 80 grammes of nitrate of potassa, given each time in the dose of one or two glasses.

Afterwards passing to the treatment of poisoning by arsenious acid, M. Orfila said, that there existed no antidote for that poison. Hydrosulphuric acid, the alkaline sulphurets, carbon, lime water, &c., so much cried up, were powerless, and often dangerous. The hydrated peroxide of iron, in his opinion, ought not again to be employed, because it required to be administered in such large doses,—because, on account of its insolubility, it combined only very slowly with the arsenious acid,—because it often contains arsenic, and because it is often more advantageous to promote vomiting and stools, and to expel the arsenical matters contained in the digestive canal, either by means of warm water taken in large quantities, or by aid of emetics and mild purgatives. By these means, we are certain that persons poisoned by arsenious acid will evacuate above and below, if not all, at least a considerable quantity of that poison.

What mode of treatment should be employed against the disease caused by the arsenious acid which is absorbed? Three modes of treatment present themselves: the antiphlogistic and emollient; the treatment by tonic medicines; and the treatment by diuretics.

The antiphlogistic method, which has been in favour from time immemorial, has been very successful with man. Bleeding in cases where there was an evident reaction, when the skin was hot, the pulse strong and frequent, and when there were or were not pustules on some parts of the body, delirium, &c., has been of incontestable utility. I have used this means, with success, twenty-one times. In some of the English medical journals, it is stated that out of nineteen cases of poisoning by arsenic, which occurred within a few years, eighteen were cured after bleeding. Dr. Schedel, who carefully noted the exaggerated effects of the arsenical medicines so often administered at the hospital of St. Louis, does not hesitate to pronounce in favour of bleeding and against tonics, for calming the irritation caused by that treatment; the experience which he gained in this respect, while with Dr. Biett, one of the most distinguished physicians, leaves no doubt on this subject. And what is opposed to such numerous and well attested facts? A few experiments on dogs, to which large doses of arsenical poison had been administered, and which died after being bled. But these experiments have been so badly performed, and so ill described, that they cannot be regarded as conclusive: the animals had not swallowed a drop of water or any other liquid calculated to promote vomiting; the bleeding was often practised a short time after the poisoning, thus facilitating absorption, &c. In the facts which you have witnessed, and which I would have multiplied, if we had time, the animals poisoned and bled have been cured; not that I mean to say that they owe their health entirely to the bleeding, since they have vomited, and vomiting has been promoted by the injection of warm water: but the bleeding has not prevented them from being cured. In conclusion, the physician ought to bleed in cases of poisoning by arsenious acid, and to administer emollients every time that there are evident symptoms of reaction.

Rasori was the first who pointed out the tonic excitant treatment as being best adapted for cure in cases of poisoning by arsenious acid: according to him, this poison acts as an asthenic, or weakening one; it must be opposed by tonics and excitants. Do cases exist in which men have been restored by this treatment? I do not know a single authentic case of it. On what then do they rely? On a few experi-

ments tried on dogs. Eleven of these animals out of nineteen poisoned hy arsenious acid, were cured by the administration of tonics. I accept these facts, hut they prove nothing in favor of the system, for all the animals which were cured had vomited abundantly, and we know that they would have been cured quite as well if they had been caused to vomit hy the exhibition of warm water. Surely it cannot be said that this liquid acts as an excitant. Again, have you not just seen two dogs poisoned by twenty-five centigrammes of arsenious acid in solution, die in the space of a few hours, although treated in the above manner? To prevent cure, it is sufficient to prevent vomiting for the first hour after poisoning, hy tying the œsophagus. Tonics, therefore, have not been sufficiently established as antidotes in all the cases in which they have heen given to dogs that have not vomited during the first hour; and if, indeed, they have been successful, it is hecause the animals had vomited hefore they were given, because they promoted fresh vomiting, or hecause they favored the secretion of urine. The physician ought, therefore, to renounce this mode of treatment, which, in addition to its inutility, may also present the disadvantage of producing intoxication, for small as the dose is that is employed, it is said to act efficaciously.

I have a few words to add to what I have already said relative to the advantages of the diuretic treatment. It is inoffensive, rational, and attended with success when the quantity of urine is considerably augmented. However, it has not yet been employed on man. Every thing induces us to believe that its effects would not be different on the human species to what it is on dogs, since in man also the organs abandon the arsenious acid absorbed, and it is eliminated with the urine. In conclusion, I will engage with the memhers of this commission, who may not be sufficiently edified by what I have shown them, to repeat to them, if they wish it, any of the experiments already made, and even to try new ones.

The sitting terminated at half-past four.

NEW METHOD OF PREPARING THE UNGUENTUM HYDRARGYRI NITRATIS; WITH REMARKS ON UNGUENTUM HYDRARGYRI.

Penzance, May 5, 1841.

Gentlemen:—Seeing in some recent numbers of *The Chemist*, prescriptions for preparing the Ung. Hydrarg. Nitrat. I send you a sample of mine, and the manner of preparing it, reduced to avoirdupoise pounds.

Mercury, one lb. of 16 oz. } dissolve in glass.
Nitric Acid, one im. pint. }

Cocoa-nut oil, four pounds of 16 oz. }
Olive-oil, six wine pints, 16 oz. } melt.

Pour the melted oils into a stone pot, the shallower the hetter; add the acid and mercury, and stir them often with a wooden spatula. In twenty-four hours it will acquire a proper consistence.

It makes an ointment of a heautiful gold color, and seldom gets harder than lard, at least with me. If less cocoa-nut oil is used, it makes an ointment of the consistence of cream. I use one-eleventh part of nitric acid less than is ordered by the Pharmacopœia. If you think this worthy a place in your small, but valuable puhlication, it is at your service. I am, Gentlemen, your obedient servant,

John Harvey.

P.S. The quickest method of killing the quicksilver in the preparation of Ung. Hyd. Fort. is to take two ounces of Ung. Hyd. Fort. that has been made some time (say a month), and add the quicksilver hy degrees, say, half an ounce at a time; one pound of it is, by this means, killed in ten minutes, and the ointment speedily completed; the stiffer the old ointment the better. I make large quantities of both ointments, and have tried all methods, but never found any to succeed better than the formulæ I have sent.

J. Harvey.

[The sample of ointment with which our correspondent has favored us, certainly is of very superior quality.]

ON THE EXTERNAL USE OF THE OLEUM JECORIS OSELLI (COD-LIVER-OIL.)

BY DR. BRACH.

For external use, Dr. Brach makes a liniment with liquor ammoniæ, in the proportion of two parts of the former to one of the latter; and finds this compound to he rubbed on the skin with more facility than the plain oil, and to possess the additional advantages of freedom from the unpleasant odor of the latter, and a greater facility of heing removed from the linen that may be stained with it. He has used this mixture often, and with good effects in chronic rheumatism and arthritic complaints, the pains of which it sometimes very speedily relieves. In scrofulous enlargements of the glands, in scrofulous diseases of the skin, and in chilblains.—Allgemeine's Repertorium, October, 1840.

POISONING BY FLOUR CONTAINING LEAD.

BY DR. SCHILBACH.

Six members of a family were suddenly seized with obstinate constipation, uneasiness, vomiting, and colic; to these symptoms succeeded spasms and severe pains, principally of the hands and feet, remarkable emaciation, paleness and anxiety. The eldest son, who suffered most, presented dilatation of the pupils, paralytic rigidity of the limbs, retraction of the abdomen, a livid complexion, and excessive emaciation. It was supposed that these symptoms arose from poisoning with lead, but without the least trace of the poison, until at last it was found out that the cupboard where the family kept their flour, there was a box full of small shot (oxidised cendric). As this box was cracked, it was supposed that a certain quantity had fallen into the flour, and accordingly an analysis of a small portion of the flour that still remained showed traces of this metal.

The patients gradually recovered after treatment with calomel and opium, and other medicines. The author cites as illustrative of this interesting case, one of severe lead colic, brought on by drinking wine from a bottle which contained some grains of lead.

EXPERIMENTS MADE ON THE ORGANS OF A DOG POISONED BY MIXTURE OF ARSENIOUS ACID AND OPIUM, WITH THE VIEW OF DETERMINING WHETHER THE ABSORPTION OF THESE TWO SUBSTANCES COULD BE SIMULTANEOUSLY CARRIED ON, AND IN THE PROPORTION IN WHICH THEY WERE ABSORBED.*

BY M. J. L. LAISSAIGNE.

Most of the experiments concerning the absorption of poisons which at different times have been tried, have in general been made on one toxical substance at a time, and in most cases with simple or compound minerals, whose presence in the blood and secreted fluids may easily be detected by chemical tests.

Experiments undertaken at different times to detect in the blood and organs of animals killed by the action of *organic poisons*, traces of those principles, have always given negative results; thus it is that the first experiments which we made in 1823 on the blood and urine of animals poisoned by the salts of morphia did not enable us to detect in those fluids the presence of that alkaloid. The same conclusions were drawn in 1826 by MM. Barruel, Sen., and Dublune, Jun., from their investigations concerning the blood and urine of a person who died from swallowing a large dose of Sydenham's laudanum.†

The new facts observed by M. Orfila, concerning the presence of mineral poisons in the organs and in the fluids secreted after poisoning, have naturally led toxicologists to try fresh experiments with the view of detecting organic poisons when absorbed.

It is with this object that we have undertaken this double experiment, which forms the subject of our present communication.

On the 12th of January last, we injected into the stomach of an old hound, in good health, a decilitre of water containing in solution 0·5 grammes of arsenious acid, and also the soluble parts of 12 grammes of crude opium. The injection was made by means of an incision in the œsophagus, and immediately below this aperture a ligature was made, as well as at the extremity of the penis to prevent the passage of the urine, which might be secreted while the animal was under the influence of the poisonous matter.

A few minutes after the injection, the animal experienced nausea, and foamed at the mouth; it was agitated, and became restless: a quarter of an hour after these effects, it became calm, and was under the influence of the narcotic: this state lasted for three hours, when it died.

The post mortem examination was very carefully made: we extracted the liver and heart, and collected all the blood contained in the cavity, and the urine, which was about three-quarters of a decilitre in quantity.

Each of these parts was first examined by the process for detecting arsenic, which we had every reason to suppose existed in them, from previous experiments on the same organs, taken from a dog poisoned by the same quantity of arsenious acid, but administered alone. The results which we obtained did not permit us to conclude the existence of arsenic, at least the traces that we found were not sufficiently distinct to establish our conviction.

Our attention, therefore, was attracted to the detection of the principles of opium, which, in this case, were, without doubt, opposed to the absorption of the arsenious acid, ordinarily so rapid. To attain this

* *Journal de Chimie Medicale*, April, 1841.

† *Journal de Chimie Medicale*, 1826, first series.

object, we acted successively on other portions of the liver, blood, and urine of the same animal.

A portion of urine evaporated under the receiver of the pneumatic machine, yielded a residue of a light yellow color, in which neither the salts of peroxide of iron, nor concentrated nitric acid manifested the reactions of either meconic acid or morphia. This residue re-dissolved in a small quantity of water was boiled with a little calcined magnesia which was afterwards collected on a small filter. This magnesian precipitate, washed and treated by boiling alcohol, did not give a trace of morphine.

The remainder of the blood was diluted in water acidulated with sulphuric acid, and the liquid was boiled for ten or twelve minutes. The resulting liquid, separated by filtration, was evaporated by heat, in a porcelain capsule. The residue of this evaporation was treated by cold alcohol, to redissolve among other principles, the sulphate of morphine, if present. The alcoholic solution yielded a residue in which it was impossible to detect the presence of morphine by means of reagents employed for that purpose.

The remaining portion of the liver, cut in small pieces, was treated, with the aid of heat, by three or four times its weight of water acidulated with sulphuric acid : the acid decoction, subjected to the same operations as the blood, gave the same results, proving the non-existence of the principles of opium in that organ.

Unless the experiment which we have detailed is incorrect, it tends to show :

1st. That opium mixed with arsenious acid, by a special action on the stomach, opposed the too rapid absorption of that acid :

2nd. That although the animal, without doubt, died from the combined effects of these two poisons, traces of their presence in the blood, urine and liver, have not been chemically discovered.

MEANS OF DISGUISING THE TASTE OF CERTAIN SUBSTANCES.*

BY M. DESCHAMPS.

The modifications to which I have subjected the process which I proposed in 1838, for disguising the taste of pills, heing so important as to make this process a new one, I have the honour of submitting it, if you think fit, to the Société de Chimie Medicale :—

R : Solid honey . .	60.00gr.
Water	6·00

Heat it in the sand-bath, and let it cool.

Put the pills and the honey in the hand, roll them and mould them together, and let them fall on powdered gum tragacanth, and shake them up. It is necessary thus to give them, at as short intervals as possible, two or three layers, and to let these two or three layers dry for one or two hours, or one or two days, according to the time that can be spared.

Weigh in a wide-mouthed flask :—	
Grénétine	50.00gr.
Alcohol at 82C. . . .	25·00
Water	125.02

Heat in the sand-bath. When the solution is finished, place in the hand some pills prepared with gum and some gelatinous liquid ; operate as above, and put them in iron moulds slightly greased.

This gelatinous solution may be employed for covering pills, as a substitute for silver.

MEANS OF PRESERVING THE ERGOT OF RYE.†

BY M. MARTIN.

Many means have been employed for preserving the ergot of rye ; I think that the one which I point out is the best, as I have preserved it for more than two years by it, and it is perfectly intact.

The following is the method that I adopt :—

Ergot in good condition and very dry is steeped in a concentrated solution of gum arabic, and dried on a sheet of white iron. When it is dry, the operation is repeated : two or three immersions are sufficient. When the last layer of gum is perfectly dry, the ergot is kept in a very dry and well corked flask.

I think that gum arabic cannot be prejudicial to the effect of ergot of rye.

ON GILDING AND SILVERING PILLS.

To the Editors of the Chemist.

Gentlemen :—On reading the last number of your Journal, I find the question :—How to silver and to gild pills, and with pleasure I answer that question.

* *Journal de Chimie Medicale*, April, 1841.

† *Journal de Chimie Medicale*, April, 1841.

The remark of B. B., is but too correct in saying, — "That the present mode adopted, is very inferior and attended with great waste." The way I have exercised for a number of years, and in which I find less waste than in any other I am acquainted with, enables to gild or silver with one leaf, about two dozen or more pills.

It is particularly necessary to see that no powder of any description is on the pills or the machine employed, and that the consistence is quite perfect; if too moist, it would, as a matter of course, consume a larger portion of silver, and if too hard, they must be moistened with a little mucilage and rubbed dry again; then use a turned wooden box, quite round inside, and introduce first about half the portion of silver into the box; put the pills upon the silver and shake it well, it will easily be seen how much more is required. A little silver, which adheres to the sides of the box, may be removed and used for other purposes. If the mass is good, the pill will only cover itself well, and will leave the superfluous silver in lammellæ in the box. It is necessary to employ an extra box for scented pills.

I think it will not be intruding, should I say a few words respecting the binding of oils with water through the medium of gum arabic, which generally takes a long time, and by which they are often spoiled or sent out imperfect. By the method which I adopt, any one will be able to bind with one drachm of gum, an ounce of almond or any other sort of oil, which is, I think, of importance, as many medical men find the great quantity of gum, used for binding the oil an obstacle, as it frequently counteracts the effects of the same.

Take one drachm of gum arabic and two of oil, mix well together, and add at once two drachms of water, or a few drops more, but never less, and rub them together; it makes in a few moments a perfect emulsion. The remainder of the oil may be gradually added, and if it should become too stiff, put a little more water to it. The more gum there is taken, the longer the emulsion will keep; but I have always found that the smallest quantity used kept twenty-four hours.

It will afford me much pleasure to spend some of my leisure hours in writing a few remarks on several pharmaceutical preparations, which I will send to you, and if you, Gentlemen, should approve of the same, you may insert them in your journal, with whose rapid advances, I am much pleased.

Yours obliged,

S.

[The above renders it unnecessary to insert the communications of W. W. and J. M.]

BOOKS RECEIVED.

Homœopathy Explained, and Objections Answered. London: T. Hurst, 5, St. Paul's Churchyard.

Annals of The London Homœopathic Dispensary, 31, Ely Place, Holborn. Physician, Dr. Curie. Nos. I. to XI. London: T. Hurst.

Edinburgh Monthly Journal of Medical Science. No. V., May, 1841.

[We regret being unable to give a review of these works in our present number: we will do so in our next.]

TO CORRESPONDENTS.

G. T.—It is an amalgam, we believe, of one part of mercury, and three parts of silver.

We consider Dr. Turner's work well adapted for a beginner. Brande's Manual is also a most excellent work.

A Dispensing Chemist.—Turner's or Brande's Chemistry; Burnett's Botany; Pereira's Materia Medica, and Brande's Pharmacy.

Communications Received from—"An Amateur Sculptor;" Mr. Haviland; Mr. Lucas; J. G.; J. S. S.; J. J. M.; A Druggist; A. B. C.; A Subscriber (Newcastle); A Reader; A Chemical Student (two letters); An Assistant. Answers in our next.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

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THE CHEMIST.

I. CHEMISTRY.

NEW INVESTIGATIONS CONCERNING GALLIC ACID.

BY M. ANTOINE LAROCQUE.

Gallic acid was discovered by Scheele in 1780, by allowing nut-galls to rot. He admitted the pre-existence of the acid in that substance, and this erroneous opinion was long held by chemists. It was only lately that M. Pelouze, in an excellent memoir on gallic acid, showed that it did not exist in nut-galls, and that the latter contained, on the contrary, nearly half their weight of tannic acid, which, according to M. P., under the influence of oxygen, gives rise to gallic acid, with a disengagement of carbonic acid. M. Robiquet differed in opinion from M. Pelouze, as to the causes of the formation of gallic acid; he thought it was under the influence of fermentation that the change is effected. However, as M. R. had not made any direct experiment in order to verify this view, I thought it very desirable to ascertain under what influence this change is brought about.

This, indeed, I had long intended to attempt, but I was timid of undertaking a subject so successfully treated by M. Pelouze. I doubted my power, but, encouraged by those to whom I had confided my ideas, I set to work. I had in my favor, the opinion of my illustrious and excellent master, M. Robiquet, and as I wished to examine nut-galls in another point of view, I determined on making investigations, resolving not to publish them unless they were interesting.

The following is the course which I pursued. I divided this memoir into three parts: in the first, I treat of the action of certain chemical bodies on macerated nut-galls; in the second, I investigate under what influence tannin is converted into gallic acid; finally, in the third part, I study the action of nut-galls on a solution of sugar, and the action of certain ferments on a solution of tannin.

I may add that I used sulphate of quinine to precipitate the tannin from my liquors: sulphate of quinine also accurately precipitates tannic acid from a solution; at least, gelatine causes no further precipitate in a liquid treated by it. The filters which I used were washed in hydrochloric acid. I always operated on 5 gram. of liquid diluted with 10 gram. of water, from which I precipitated the tannin by an excess of sulphate of quinine. I always left the precipitates until next day to form. I collected them on filters, washed them with distilled water, then dried them, and it was only after having ascertained that they lost nothing more by heat, that I weighed them.

FIRST PART.

EXAMINATION OF THE INFLUENCE OF CERTAIN CHEMICAL AGENTS ON GALLIC FERMENTATION; ITS RESEMBLANCE TO ALCOHOLIC AND PUTRID FERMENTATION.

Do not certain bodies prevent or hinder gallic fermentation, or the conversion of tannin into gallic acid? It was very curious to ascertain whether the bodies which prevent or hinder, for some time, the alcoholic or putrid fermentation, had any action on the transformation of tannin into gallic acid.

I ascertained by many experiments which I am about to detail, that oxide of mercury, alcohol, nitric, hydro-chloric and sulphuric acids, bromine, essence of turpentine, creosote, oxalic, acetic and prussic acids, had the most powerful action on it. Among those which have a less energetic action, may be ranked arseniate of soda and corrosive sublimate; camphor, citric acid and red oxide of mercury, are without action on it; tartaric acid, on the contrary, appeared to favor this fermentation.

The following is the manner in which I operated: the experiments were commenced on the 25th of September.

I put 20 gram. of powdered nut-galls into 110 gram. of water, and placed the vessel in a room where the temperature varied from 10° to 15° C. I prepared four similar liquids, and on the 2nd of November, I precipitated 5 gr. from each of them by the salt of quinine. I obtained the following results:—0·03 centigram. of tannate of quinine in two liquors, and in the other two, 0·033 and 0·031 milligrammes of tannate of quinine. These precipitates were obtained in a type liquor, and served me for comparison with those of other liquors.

ALCOHOL AND WATER.

Alcohol	50	gram.
Water	60	,,
Nut-galls	20	,,

I prepared four similar liquors, and obtained the following weights:—

0·45 centigr.
0·47 ,,
0·46 ,,
0·46 ,,
} Tannate of quinine.

WATER AND OXIDE OF MERCURY.

Water	110	gram.
Powdered nut-galls..	20	,,
Oxide of mercury ..	1	,,

I prepared four similar liquors, on which I may make the following remarks:—

The oxide of mercury, a few days after its contact with the liquor, became brown; it appeared to be reduced to the state of black oxide; I examined it with a lens, but could not find any metallic globules. By means of a thread, I suspended a piece of oxide of mercury weighing several grammes, in nut-galls in a state of maceration: after eight days it acquired a chocolate brown color, which increased by longer contact; the interior of this oxide was of a reddish brown color. Was a deoxidizing gas disengaged from the nut-galls? Was this gas carburetted hydrogen or pure hydrogen? This I was unable to ascertain. It is known, indeed, that nascent hydrogen reduces certain metallic oxides; that of iron, for instance, is very rapidly deoxidized: at the *Hôpital de la Charité*, I suggested this as a means of removing iron-mould from linen.

It may be said that this reduction is owing to tannin; but to ascertain this, I put some oxide of mercury into a solution of tannin, and left it there for more than six weeks, and after that time, the oxide of mercury retained its red colour: it is not owing to the contact of that oxide with nut-galls, since that which was suspended in the liquor became brown. The following are the weights of the precipitate obtained in these liquors:—

0·64 cent.
0·65 ,,
0·65 ,,
0·63 ,,
} Tannato of quinine.

ARSENIATE OF SODA AND WATER.

In 110 grammes of water, I dissolved 1 gram. of crystallized arseniate of soda, and I added to the solution 20 gram. of powdered nut-galls, I prepared four similar liquids, and obtained the following results, always operating on 5 gram. of

0·25 cent.
0·23 ,,
0 27 ,,
0·24 ,,
} Tannate of quinine.

BICHLORIDE OF MERCURY.

In 110 gram. of water, I dissolved 5 decigr. of corrosive sublimate; I added a few drops of alcohol to facilitate the solution, and I mixed with the liquid 20 gram. of powdered nutgalls. Four liquids prepared in this manner gave, on the 6th of November, the following results:—

0·17 cent.
0·17 ,,
0·17 ,,
0·16 ,,
} Tannate of quinine.

On the 16th of December I made some new experiments to ascertain the action of certain other agents on gallic fermentation; for these new experiments, I likewise took 110 gram. of water, and 20 gram. of powdered nut-galls; I always operated on 5 gram. of liquor. In these experiments, I took the same precautions as in the preceding. Into 110 gram. of water, I put 20 gram. of powdered nut-galls; three days after, I precipitated the tannin from 5 gram. of the liquor by the salt of quinine; I obtained 60 cent. of the tannate; thence I ascertained to what point the bodies which I put in contact would form an obstacle to the progress of the phenomenon. After 28 days' contact, I again precipitated the tannin from 5 gram. of liquor, and I obtained only 20 cent. of tannate of quinine; the conversion of tannin into gallic acid was therefore about $\frac{2}{3}$. Let us see if we shall obtain similar results in the following liquors, but containing chemical agents. In the liquor into which I had put 6 drops of creosote, I obtained, after twenty-eight days' contact, 0·35 of tannate; in the liquor containing 30 drops of essential oil of turpentine, 0·43 cent. of tannate; in that to which I had added 12 drops of castor oil, 0·22 cent., the liquor containing 6 decig. of citric acid, 0·20 cent.; and the liquor containing 6 decig. of tartaric acid, and 0·15 cent. of tannate.

With the following liquids prepared in the same proportions (110 gram. of water and 20 gram. of nut-galls), and to which I

had added—to the first, 20 drops of pyroligneous acid, to the second 12 drops of sulphuric acid, to the third 12 drops of nitric acid, to the fourth 12 drops of hydrochloric acid, to the fifth 12 drops of hromine, and to the sixth, 12 drops of prussic acid—I obtained the following results :—

The acetic liquor gave	0·35 cent.	Tannate of quinine.
The sulphuric ,,	0·59 cent.	
The nitric ,,	0·55 cent.	
The hydrochloric ,,	0·50 cent.	
The hromic ,,	0·45 cent.	
The prussio ,,	0·35 cent.	

These results appeared to me to he very curious. Indeed, in the liquors where no agent could modify the progress of the phenomenon, the tannin was almost entirely converted into gallic acid, whilst in the liquors containing the above-mentioned hodies the progress of the fermentation is arrested, and very little gallic acid is formed. If among these hodies there he some which do not act with so much energy as in the alcoholic fermentation, it must be attributed to their having heen used in too small quantities, or perhaps to a douhle decomposition, as is the case with the bichloride of mercury. With regard to the arseniate of soda, it is known, from M. Quevenue's experimeuts, that arsenious acid does not stop the fermentation of sugar; the same also, from the action exerted by that salt on the fermentation of galls, it may he concluded that it has only a very feehle action on the progress of the phenomenon. I will not call to mind the action of acids, nor that of alcohol: these hodies are frequently employed to stop putrid or alcoholic fermentation. The action of oxide of mercury on alcoholic fermentation is well known; indeed, this oxide has long been used by the Burgundians for preventing vinous fermentation in the harrels; it also seems to possess the greatest power of stopping the fermentation of galls.

Now, what are the points of resemblance hetween these three kinds of fermentation? They have the same action with the same suhstances; I think also that it is impossihle to separate them, for in all there is a disengagement of gas and of heat, a developement of ferment, and the conversion of one hody into another.

I say that there is a deposit of ferment; indeed, if we examine with the microscope the yellowish-white or greyish-white powder which is deposited in macerated nut-galls, or in a filtered infusion of the same, we find in that deposit all the properties of heer yeast; however that of nut-galls is less in quantity; the glohules are paler, and under the form of links. These are from $\frac{1}{500}$ to $\frac{1}{200}$ of a millimetre. There are also deposited in these liquors, flocks of an alhuminous appearance, which, examined with the microscope, are presented under an arhorescent form, with spreading branches. They are hifurcated and sprinkled with hlack spots.

Liehig is of opinion that the conversion of tannin into gallic acid, when nut-galls are allowed to ferment, is a phenomenon of *érémacausie*. I will quote *verbatim* the paragraph 3 of the *Revue Scientifique* for June, page 393, and paragraph 11, page 403, of the same work.

In paragraph 3 that chemist says, "*Erémacausie* (vulgarly called rotting) differs from fermentation and putrifaction in its not taking place without contact with the air, which acts hy means of its oxygen; it is a kind of slow comhustion which, under all circumstances, disengages heat and sometimes light." In paragraph 11, he adds :—"Most organic suhstances, put in contact with matters in a state of *érémacausie*, themselves undergo that alteration; it may almost he said that it is propagated hy a kind of contagion. Wood, when rotting, hrings fresh wood to the same condition; and it is the finely divided rotting woody matter that so rapidly converts the tannic acid of nut-galls into gallic acid."

Then, to sum up Liebig's idea, the presence of oxygen and woody matter is indispensahle for effecting the transformation of tannin into gallic acid; I will mention facts which will prove that the contrary is the case.

In the first place, I assert that in this transformation rotting does not always take place; moreover, the presence of oxygen is not indispensable for effecting the conversion of tannin into gallic acid; it is a fact acquired to science, and the discovery of which is due to M. Robiquet. I will also mention an experiment which I made, in which there were only a few buhhles of air that I could not get rid of, and in which I effected the conversion of tannin into gallic acid. Indeed, hy admitting the pheuomenon of *érémacausie*, how is the conversion of tannin into gallic acid, when an infusion of nut-galls freed from all woody matter hy filtration is exposed to the air, to he explained? All these facts are inexplicahle according to the phenomeuon of *érémacausie*, and are naturally explained when fermentation is admitted.

I have said that rotting does not always occur; I have also said that in the presence of a scarcely perceptihle quantity of air, I obtained the conversion of tannin into gallic acid; the following experiment, which I have thrice repeated, proves what I have just advanced :—

I put into a flask stopped with emery 10 gr. of nut-galls which had heen acted on hy ether, 5 gr. of tannin, and 123 gr. of water. The flask was exactly filled, with the exception of a hubhle or two of air which remained in it. I luted the flask to preveut

the air from penetrating into it, and I thus exposed it for a month to a temperature varying from 6° to 10°; during that time it showed no trace of mouldiness, which destroyed the idea of its rotting; moreover, all the tannin was converted into gallic acid; it is necessary also to remark that there was no perceptible disengagement of gas.

It is very evident that the conversion of tannin into gallic acid cannot be owing to *érémacausie*, for in paragraph 3 above quoted, M. Liebig sets forth that *érémacausie* differs from fermentation, in not being effected without the contact of the air, which acts by means of its oxygen; however, since under a small quantity of air, tannin has been converted into gallic acid, it is evident that there is some other agent than oxygen, under the influence of which this transformation is effected; for I repeat, it is only in contact with a great quantity of air that *érémacausie* can be developed, and not in a vessel where there is only an inappreciable quantity of oxygen gas.

Moreover, M. Robiquet, in a memoir printed in the *Annales de Chimie et de Physique*, Vol. lxiv., says that he obtained gallic acid from nut-galls without their rotting, and without contact with the air. Finally, I will mention another fact which appears to me conclusive against the phenomenon of *érémacausie* applied to the formation of gallic acid. When a filtered infusion of nut-galls is exposed to the air, after a certain time it allows a certain quantity of gallic acid to deposit. It is decidedly not the woody matter which acts in this case; it is the ferment which is deposited after some days of contact with the air, that effects this transformation.

SECOND PART.

CAN TANNIN BE CONVERTED INTO GALLIC ACID UNDER SEVERAL INFLUENCES?

Tannin may be converted into gallic acid under the influence of several bodies, for it results from M. Pelouze's experiments that a solution of tannin, under the influence of oxygen, is transformed into gallic acid, giving rise to a disengagement of carbonic acid. This change is not however effected in a very short space of time, for M. Robiquet proved that this change took place only after some months of contact, and also that nearly half of the tannin underwent this alteration. If it requires so long a time to effect this under the influence of oxygen, we shall find in nut-galls a body which will do it in a much shorter space of time. I will show also that a very small quantity of nut-galls is capable of converting a large quantity of tannin into gallic acid. The following are the experiments which I made to ascertain under what influence this change is operated. I used nut-galls exhausted by ether, as a ferment; I put it in contact with the solution of tannin; I made another solution of tannin which served as a type liquor, or liquor of comparison.

On the 27th of August, 1840, I took 10 gr. of nut-galls exhausted by ether, 5 gr. of tannic acid, and 110 gr. of water; the type liquor consisted of 110 gr. of water and 5 gr. of tannic acid. I kept these liquors in flasks covered with paper perforated with holes, until the 21st of September, and as I then wished to ascertain the state of the liquors, I took 1 gr. of each and added an excess of sulphate of quinine: I obtained no precipitate from that containing the nut-galls; the type liquor, on the contrary, gave an abundant precipitate. I did not expect so good a result: I multiplied my experiments, and the following corroborate the preceding. It will be seen that a small quantity of nut-galls is capable of converting 15 gr. of tannin into gallic acid.

On the 23d of September, I put into a wide-mouthed flask, of the capacity of 125 gr. 5 gr. of tannin, 5 gr. of nut-galls exhausted by ether, and 100 gr. of distilled water, and I exposed it to the air until the 7th of November. Into a second flask, to the same quantity of water and nut-galls, I added 8 gr. of tannic acid, and to a third, 15 gr. of tannic acid. On the 7th of November, I precipitated the tannin from 5 gr. of each of these liquors, and I obtained exactly the same weight of tannate of quinine from each—0·04 cent. These experiments appeared to me very curious, inasmuch as even 15 gr. of tannin under the influence of 5 gr. of nut-galls exhausted by ether, convert in a very short time as large a quantity of tannin. Finally, two other experiments made with 5 gr. of tannin, 128 gr. of water and 5 gr. of nut-galls exhausted by ether, gave me, after a contact of a month, 0·04 cent. of tannate of quinine, whilst two other liquors prepared with the same proportions of water and tannin, without any nut-galls, yielded 0·30 of that salt. These four liquors were prepared on the same day, and were exposed to the same influences.

If it had not been shown by M. Pelouze's experiments that gallic acid did not pre-exist in nut-galls, those which I have detailed would have more evidently demonstrated it.

THIRD PART.

DOES THERE EXIST IN NUT-GALLS A FERMENT CAPABLE OF CONVERTING SUGAR INTO ALCOHOL?

This property, which sugar possesses, of being converted into alcohol and carbonic acid under the influence of certain bodies is very remarkable: it has been called fer-

mentation. Many bodies possess this property in a greater or less degree. In the first rank must be placed beer yeast; it converts sugar into alcohol, in a very short time, when the temperature is suitably raised. Albumen, fibrine, caseous matter, muscular flesh, &c., possess this property in a minor degree. There is a substance which has not yet been noticed as a ferment, and which, notwithstanding, possesses that property in a high degree—I mean nut-galls. I mixed about 30 or 40 gr. of sugar, 300 gr. of water, and 20 or 25 gr. of nut-galls. I exposed the mixture to a temperature of 18 or 20° C.: some time after, the fermentation was perfectly set up; still the bubbles of gas which I passed into a vessel filled with water were not very numerous, for a day or two; but after that time, a disengagement of carbonic acid took place in a tumultuous manner; it lasted 12 or 15 days; I strained the liquor and distilled it; I extracted by the first distillation 125 gr. of liquor marking $12\frac{1}{2}°$; a second distillation gave 30 gr. of alcohol marking 17°.

I made another experiment with nut-galls exhausted by ether, in nearly the same proportions as the preceding, and I remarked that it stopped for two days and commenced with fresh energy. One thing in particular appeared to me to be worth attention, and that is, the entirely different odour which these two liquors possessed: that which was fermented with nut-galls exhausted by ether, had an acetic odour, whilst the other, on the contrary, had the odour of fermenting matters, that of beer for example.

Towards the month of November, at a season when the temperature is unfavourable to the developement of fermentation, I made new experiments, in order to ascertain whether the variations of temperature influenced the progress of the phenomenon; I did not obtain a regular fermentation; I did not even effect the alcoholisation of the sugar, when I submitted the mixture alternately to a strong heat, and cold.

I have also ascertained that nut-galls moistened with water and exposed to a temperature of 8 or 10° below zero, for 24 hours, have not lost the property of fermenting sugar. Heat, on the contrary, destroys this property, at least for a certain time. I put into 300 gr. of water, 20 grammes of nut-galls and 30 gr. of sugar; I raised the temperature of the mixture to 40°, and let it cool, and so on, several times, and I obtained no fermentation. I plunged a liquor into water marking 60° C.; much carbonic acid gas was disengaged; I removed the flask from the warm water, and it showed but very uncertain signs of fermentation.

The temperature which appears best suited for fermentation is that of 18 to 20° C., and a mixture of 1 part of nut-galls, 4 of sugar, and 7 of water. However, fermentation commences at 10° C.; weak at first, it increases as the temperature approaches 18 or 20° C.

The property which the ferment of nut-galls possesses, of converting sugar into alcohol, being known to me, I wished to ascertain whether that of beer would change tannin into gallic acid; I put into a flask 5 gr. of tannin, 5 or 6 gr. of beer yeast, and 300 of water. I exposed the mixture to a variable temperature; twenty days after it slightly precipitated the solution of sulphate of quinine; I exposed the vessel to a temperature of more than 30° C., for 4 days, and after that time the liquor had no action on the solution of sulphate of quinine; I filtered it with a paper washed in hydrochloric acid, and I obtained a blackish residue of insupportable bitterness, with an acid reaction. I dissolved it with alcohol and animal charcoal, and allowed it to filter spontaneously. I procured a small quantity of gallic acid under the form of stellated needles.

In the month of December, I put fresh ferment in contact with tannin: on the 15th of January all the tannin was not converted into gallic acid. This difference of results was owing to my not having operated in the same manner as before.

If beer yeast does not convert tannin into gallic acid as rapidly as might be expected, it is not the same with muscular flesh, blood, &c. Indeed, I put into 180 gr. of water, 5 gr. of tannin, and nearly 60 gr. of muscular flesh; I exposed the whole to a temperature of 10 or 12° C., then I raised it to 15 or 18°. This liquor acquired a slight putrid odour, and a month afterwards it was without action on sulphate of quinine and the solution of gelatine; the filtered liquor, evaporated to dryness, and re-dissolved with alcohol and animal charcoal, was filtered and set to evaporate in the sand-bath to three-fourths; left to spontaneous evaporation, it gave crystals of gallic acid of a rather deep red-brown color. I made another experiment with putrified blood, and after twelve days' contact, the liquor did not precipitate the salt of quinine. I could not procure the gallic acid from this liquor, the flask having broken on the fire.

I made another experiment with meat in a state of putrefaction: I left it for one or two hours in contact, then I precipitated 5 gr. of the liquor, and obtained 0·35 of tannate; four days after, the same quantity of liquor gave me only 0·10 cent., and after 10 days, it scarcely precipitated the solution of sulphate of quinine at all. I filtered this liquor, evaporated it to dryness in a sand-bath, then I re-dissolved it in alcohol and animal charcoal, filtered it, and left it to spontaneous evaporation: there remained in

the capsule a small quantity of a reddish matter, which was submitted to the action of ether, which, spontaneously evaporated, left small quantities of gallic acid.

In this experiment, the tannin must be converted into other products, or form a combination with the meat, for I obtained only a very small quantity of gallic acid. However, I got sufficient to prove that it was not under the influence of oxygen that it was formed.

Caseous matter also possesses the property of converting tannin into gallic acid; however, it is only after a much longer contact than with meat.

SUMMARY OF THE PRINCIPAL FACTS.

1st, Tannin may be converted into gallic acid under several influences: first, as M. Pelouze observed, under that of oxygen, and under that of a ferment.

2d, Certain chemical bodies prevent, for a certain time, the conversion of tannin into gallic acid.

3d, It is not to the phenomenon of *erémacausie* that this conversion must be attributed.

4th, The ferment of nutgalls converts sugar into alcohol and carbonic acid, as does that of beer.

5th, Beer yeast, muscular flesh, and caseous matter change tannin into gallic acid.

6th, Finally, in the conversion of tannin into gallic acid, the quantity of gas disengaged is scarcely perceptible.

INVESTIGATIONS CONCERNING LACTIC FERMENTATION.*

BY MM. BOUTRON-CHARLARD AND E. FREMY.

We proposed to study the circumstances in which lactic acid is formed, and accurately to ascertain the nature of the agents which determine its formation. As the experiments that we are going to describe depend on a single force which is very analogous to that which gives rise to alcoholic fermentation, we have given it the name of *lactic fermentation.*

Our object was not only to find a means of producing at will a body which is as important in a theoretical point of view as in its medicinal applications, but especially to determine the mode of production of an organic acid which bears so striking an analogy to malic, citric, and tartaric acids, concerning the formation of which we have not, at present, any precise data.

We may recapitulate the works which we have found useful in our investigations: we may mention in the first place, those of M. Thenard, on the action of albumen on sugar; the experiments of M. Persoz, on diastasis; those of M. Dubrunfaut, on fermentation; and the observations which Liebig has lately published in his *Organic Chemistry.* Finally, we have connected our experiments with those made by one of us, M. Fremy, on pectine and pectic acid (See *The Chemist*, Vol. I, No. VIII, page 233), and with the investigations which we published at the same time as M. Bussy, on the production of volatile oil of mustard. (See *The Chemist*, Vol. I. No. III, pp. 77 and 78, and No. IV., pp. 106 and 108.)

It is known that lactic acid is one of the most important which organic chemistry presents, and that it is formed under many circumstances. It is met with in almost all the fluids of the animal economy, in the products of the fermentation of vegetable juices, in the waste water of the starchmaker, and in milk exposed for several days to the air. We therefore examined the mode of producing lactic acid in the cases we have mentioned, first investigating the nature of the matter converted into that acid, as well as the properties of the ferment effecting this conversion. We ascertained that under the influence of certain animal matters, many neutral substances may be converted into lactic acid, and this conversion is the more clear as these substances are less likely to give rise to alcoholic fermentation: we may mention more particularly dextrine and sugar of milk.

All organised matters of vegetable or animal origin are apt, when exposed to the air for some time, to convert neutral substances into lactic acid.

By carefully studying the action of various animal matters on neutral substances, we remarked that they might, by going through different degrees of deorganisation, become susceptible of undergoing alterations corresponding to these degrees of decomposition. The *modus operandi* of a ferment does not, therefore, depend only on its nature, but also on the decompositon which it undergoes. Thus it is, for example, that diastasis may at first convert starch into dextrine and sugar, and afterwards into lactic acid, and finally into alcohol and carbonic acid.

From these data we understand, that when we wish to study the action of an animal matter on a neutral body, the decomposition of the ferment must necessarily be stopped; for otherwise, instead of obtaining the result of the action of a single ferment, we should have the complicated products of a series of ferments, each having its special property. To give an example in support of our assertion, we may say, that a membrane is capable of transforming it, as every one knows,

* Read before the Academy of Sciences, Paris, April 26, 1841: *Comptes Rendus*, No. 17.

into lactic acid, mannite, viscous matter, alcohol, and carbonic acid; but if we can stop the modifications which the membrane undergoes, it would then be ascertained that the products which we have just mentioned are not formed at the same time, but that they are the result of a successive alteration in the animal matter.

Does not this phenomenon bear great analogy to the observations which M. Pélouze has lately made on the distillation of organic matters? It is known, indeed, that he ascertained that, in order to study the successive modifications which an organic matter undergoes by distillation, it is important to take account of the degree of heat to which it is submitted. We think, also, that in the study of lactic fermentation, account must be taken of the modifications which the ferment undergoes, in order not to fall into the very complicated reactions which the distillation of organic matters presented before M. Pelouze's investigations.

From the principles which we have just established, it results, therefore, that, to obtain a very clear lactic fermentation, a ferment which is not very alterable must be used.

In our Memoir we pointed out the characters of lactic fermentation, the real part acted by atmospheric air in this operation which causes the modifications of the ferment, and we come to the examination of the different products of lactic acid.

Thus, for example, to explain the presence of lactic acid in the liquids of the stomach, we submitted certain neutral bodies to the action of animal matters which are ordinarily in contact with them, and we ascertained that those which are easily altered give rise to a complex fermentation, whilst membranes which are less alterable are capable of converting neutral substances into pure lactic acid. We think that these facts, which may account for the presence of lactic acid in the animal economy, are worthy the attention of physiologists.

If we proceed thence to the examination of the formation of lactic acid in vegetables, we see that almost all matters of an albuminous nature are susceptible, when they have been modified by the contact of the air, of converting neutral substances into lactic acid. The most remarkable conversion of this kind is that which diastases causes in dextrine. Indeed, if cross-spired barley be exposed for two or three days to damp air, the diastasis which it contains is modified, and is then capable of converting dextrine into pure lactic acid. Does not this conversion to a certain extent explain the sudden appearance of acids in fruits, and does it not clear up some of the most obscure phenomena of vegetable physiology?

A high temperature may neutralize the actions of the animal matters which produce lactic fermentation, but it does not completely destroy it, for we have found that these matters may in many cases recover that property. This observation appears to us important in the consequences which it may have on the manufacture of sugar, for it has lately been proposed to dry the canes and the beet root, in order to be able to extract the sugar at a more favourable season. On examining dried canes and beet root, we found that they often contained a great quantity of lactic acid, which might, as every one is aware, occasion great losses in manufacture.

Finally, we proceed to the alteration which milk undergoes when exposed to the air, and showed that it is the caseum that converts the sugar of milk into lactic acid, that its action is stopped by the compound which it forms with the acid it produces, and that it may be rendered capable of again acting on sugar of milk, by saturating with bicarbonate of soda the lactic acid with which it is combined. We were thus enabled to convert not only all the sugar of milk into lactic acid, but also sugar of milk added. We think that this experiment accounts for one of the most important productions of lactic acid, and we are warranted in believing that caseum is the real ferment of sugar of milk, as beer yeast is to ordinary sugar. This trial has given us the means of preparing lactic acid at will, and we give, in our memoir, a detail of the process we followed.

We think then that the experiments of which we have now read an abstract, evidently show the influences under which lactic acid is formed, and that they prove that this acid is not one of the products of the complicated fermentation to which the name of viscous fermentation has been given, but that it is the product of a special fermentation to which we have given the name of lactic fermentation.

In a second memoir, we hope to prove that mannite is also the result of a peculiar fermentation.

ON THE DECOMPOSITIONS PRODUCED BY AFFINITY.*

BY REUBEN PHILLIPS.

The supposition that when two acids and a base are mixed in solution, the base is divided between them, is an opinion that has long been more or less prevalent in chemistry. The same view has been extended to the salts, and it has been supposed that when two soluble salts, such as the sulphate of potassa and nitrate of soda, are

* Communicated by the Author.

mixed together in solution, each acid appropriates to itself a portion of both bases, producing four salts. Turner has adopted these hypotheses in his *Elements of Chemistry*.

But if acids participate with each other in the possession of a base, why should not other substances do the same? Why should not iodine deprive chloride of potassium of part of its potassium? Why should not bromine, iodine and chlorine, share hydrogen between them? It may be said, that the affinities of these bodies are so different as to form exceptions to the rule. But is this division certainly known to take place in any case? In all cases, where, if it existed, evidence of it could be obtained, there, invariably, no such thing can be found. Can any one suppose, that a solution of hydrochloric acid, liberates hydriodic acid from a soluble iodide?

If any such participation does take place, then I can see no reason why hydrochloric acid should not displace some sulphuric acids from the sulphates; but I have experimentally ascertained such not to be the case.

I took three glasses, and placed in one, a portion of sulphate of soda, in another, some sulphate of magnesia, and in the third, alum: I then poured into each a quantity of hydrochloric acid; and a few minutes afterwards, added iodide of potassium and starch; but no iodide of starch was formed. Now, if free sulphuric acid existed in the solution, it would have decomposed the iodide of potassium, and the iodine must have united with the starch; but since no such effect was produced, I infer that the sulphuric acid was entirely confined to the bases.

With regard to this mutual participation when two salts are concerned, if it takes place in any case, I can assign no objection why chloride of sodium should not change the blue solution of sulphate of copper to a green, nor why, reciprocally, sulphate of soda should not change the green solution of chloride of copper to blue. I accordingly, took a concentrated solution of sulphate of copper, and added to it common salt, the colour instantly changed from blue to green; but by the intensity of the colour I was led to consider that the sulphate of copper had experienced entire decomposition, and I found upon adding sulphate of soda to the pure chloride of copper, the green tint not in the least impaired.

Since it cannot be proved that there is a participation of a base between two rival acids, and of an acid between two rival bases, and since it cannot be proved that the mingled solution of two salts present in equivalent proportions gives rise to four, and as much of an irreconcileable nature is known to the contrary, it appears to me that the doctrine should be entirely rejected, and that some theory, more consistent with facts, should be substituted in its room.

Now, it is well known that if two bodies are able to combine together, their mutual affinity is increased by the presence of a third substance capable of uniting with the compound which they produce. In cases of decomposition, where the whole or part of the resulting product is insoluble, I think there can be but little or no attraction exercised between the insoluble compound and the menstruum, so that cohesion, or the attraction of homogeneous particles, prevails; the explanation of this species of decomposition is now obvious: the affinity is governed, not by the influence of a third substance, but by the attraction of the particles of the insoluble substances for each other. If, for instance, the solutions of nitrate of baryta and sulphate of soda be mixed, the affinity of the sulphuric acid for baryta will be increased by the water having but a feeble attraction for the sulphate of baryta, whereby the atoms of that salt are enabled to combine together without much opposition.

It may certainly be asked, how the sulphate of baryta can act before it has any existence; but I apprehend that any explanation, suited to what was once called disposing affinity, equally applies to this.

ON THE DECOMPOSITION OF AMMONIA BY THE OXYGENOUS COMPOUNDS OF NITROGEN.*

BY M. J. PELOUZE.

When sulphuric acid is put in contact with nitrate of ammonia, at the ordinary temperature, this salt is gradually dissolved, and the liquor does not present any unexpected phenomenon, whatever may be the proportions or state of concentration of the bodies which compose it, that is to say, re-agents indicate in it ammonia, and sulphuric and nitric acids.

If the mixture contains water, and if it be submitted to distillation, nitric acid is procured, and also sulphate of ammonia, as theory indicates.

When, on the contrary, nitrate of ammonia has been deprived by heat of all the water which it can lose without being destroyed, and when heated in a very great excess of concentrated sulphuric acid, in fifty times its weight, for example, the contrary is the case. At 150° C., the mixture disengages a great quantity of protoxide of nitrogen, water is formed and combines with the sulphuric acid, and neither nitric acid nor ammonia are found in the products of

* *Journal de Pharmacie*, May, 1841.

this remarkable re-action. The nitrate of ammonia acts under these circumstances as it does, in a no less curious manner, under the sole influence of heat, and it is the only nitrate that does not disengage nitric acid ou the addition of sulphuric acid, at the same time that it does not give up its base to that more energetic acid.

When the proportion of concentrated sulphuric acid is much diminished — when, for example, we operate with 10 parts of that acid and 1 part of nitrate of ammouia,—75 per cent. of this salt are decomposed into nitric acid and ammonia, and the remaining 25 into protoxide of nitrogen and water. By gradually diminishing the proportion of sulphuric acid, no protoxide of nitrogen is obtained, so that with one equivalent of nitrate of ammonia and two equivalents of sulphuric acid, the phenomena do not deviate from the ordinary rules of the decompositionof a salt by a more fixed acid.

These rules are also observed when, instead of carrying a mixture of nitrate of ammonia and a great excess of very concentrated sulphuric acid to 160°C., it is kept between 90° and 120° C. This temperature, though insufficient for the conversion of nitrate of ammonia into water and protoxide of nitrogen, is, however, high enough to distil the nitric acid eliminated by the sulphuric acid, and it passes into the receivers, without being accompanied by protoxide of nitrogen.

From the preceding facts it results that, according to the respective proportions of nitrate of ammonia and sulphuric acid, the temperature of the mixture and the quantity of water contained in it, the products of the decomposition are very different.

Analogy indicated that the nitrate of ammonia ought to act in a similar manner. Experiment confirmed this idea. This salt, decomposed by a great quantity of concentrated sulphuric acid, under the influence of heat, was converted into water and nitrogen.

The deutoxide of nitrogen seems less to give way to these re-actions: nevertheless, I easily decomposed it by means of ammonia, with the assistance of concentrated sulphuric acid. Profiting by the observation lately made by A. Rose (See *The Chemist*, No. XVIII., page 161), that monohydrated sulphuric acid directly combines with deutoxide of nitrogen, and absorbs very considerable quantities of that gas, I prepared this compound, dissolved sulphate of ammonia in it, and submitted it to a temperature of about 160° C. Perfectly pure nitrogen was disengaged, without any mixture of protoxide or deutoxide of nitrogen.

I varied this experiment by passing deutoxide of nitrogen into concentrated sulphuric acid mixed with sulphate of ammonia, and raised it to a temperature of from 150° to 200°C. The deutoxide of nitrogen was decomposed as in the preceding case, and pure nitrogen was disengaged. This gas was mixed with deutoxide only when the disengagement of the latter was too rapid.

The decomposition of ammonia by the deutoxide of nitrogen, in presence of concentrated sulphuric acid, is so easy, the nitrogen produced is so pure, and it is so regularly disengaged from the mixture, that I do not doubt but this re-action may be turned to account by chemists, for the preparation of this gas. Besides, this new process is very simple, for it is sufficient to make the sulphuric acid of commerce absorb deutoxide of nitrogen, and when it is wished to prepare nitrogen, to take this compound, and add to it sulphate of ammonia, and to gently heat the mixture.

This action is perfectly clear, and as a means of preparing nitrogen, leaves nothing to be desired.

As to the protoxide which is formed when an excess of concentrated sulphuric acid is heated with nitrate of ammonia, it is not pure; it always contains nitrogen, and it is sometimes mixed with traces of red vapors. It also sometimes happens that a very small quantity of nitric acid escapes from the mixture, and thus is freed by its volatility, from the ulterior action of the ammonia. However, the principal re-action, that which evidently regulates all the others, is the conversion of nitrate of ammonia into protoxide of nitrogen and water.

I have said above, that nitrate of ammonia, heated with ten times its weight of concentrated sulphuric acid, gave me nitric acid in such quantity, that only the fourth of that acid had been destroyed. As I had remarked in this re-action much protoxide of nitrogen, and but a small quantity of red vapors, I was led to doubt the complete accuracy of a fact which is mentioned in all chemical works; namely, that concentrated sulphuric acid decomposes nitric acid into water, with which it combines, into oxygen and into hyponitric acid. This doubt became certainty on seeing nitric acid disengaged at 100°C., from a mixture formed of nitrate of ammonia and an enormous excess of concentrated sulphuric acid. I mixed with 500 grammes of very concentrated sulphuric acid, 100 grammes of nitric acid of the density of 1·448. I slowly distilled this mixture, and I procured from it 88 grammes of nitric acid of the density of 1·520. This acid, freed by a gentle heat from the greater part of the red vapors which give it a yellow colour, was mixed with six and a half times its weight of very concentrated sulphuric acid, without any perceptible elevation of temperature. This mixture was colourless, and gave out extremely thick white fumes of nitric acid. Raised to a temperature not

exceeding 150° C., and for a long time kept as near as possible to 100° C., 82 grammes of nitric acid, the density of which was 1·520, and the boiling point of which was from 86° to 88° C., were distilled over.

A third rectification with sulphuric acid made no alteration in either the properties, density, or color of the nitric acid.

I am inclined to think that the small loss observed in the repeated distillations of nitric acid with sulphuric, must he attributed less to the action of the sulphuric acid than to the action of light, and especially to that of heat. This is certain, that the same loss is sensibly experienced in the distillation of monohydrated nitric acid, whether it he distilled alone, or with sulphuric *acid*, and that in both cases the proportion of red vapors is the same: the first hydrates of sulphuric and nitric acids appear to me to be without action on one another; there is no elevation of temperature when they are mixed. Nothing proves that one of these hydrates has more affinity than the other for the water which the latter contains above one equivalent; in its turn concentrated nitric acid can remove water from aqueous sulphuric acid.

The preceding observations have led me to employ with advantage concentrated sulphuric acid for concentrating nitric acid. To obtain this acid perfectly pure, it is sufficient to rectify, two or three times, the acid of commerce with sulphuric acid of ordinary quality, with the single precaution of not raising the temperature beyond 140° or 150° C. A gentle boiling, and a small quantity of puce oxide of lead added to the distilled acid, are sufficient for removing any hydro-chloric acid that it may retain. There does not remain in acid thus treated the smallest quantity of lead.

The property which ammonia possesses of decomposing, by its hydrogen, the various oxygenous compounds of nitrogen which are dissolved in sulphuric acid, is susceptible of a very important application — the purification of the sulphuric acid of commerce. This acid is frequently deteriorated by deutoxide of nitrogen and nitric acid, the presence of which is prejudicial under many circumstances. No rapid and economical process for freeing sulphuric acid from these nitrous compounds is yet known. Powdered sulphur, and lamp-black destroy them, it is true, but their employment is subject to many inconveniences which cause it to he abandoned. Sulphate of protoxide of iron answers this purpose very well; but the acid must he distilled, or a very considerable quantity of that salt would be left in it. Ammonia, or rather sulphate of ammonia, is the best agent that can he used for this purpose. The acids containing most of the nitrous compounds are completely freed from them by $\frac{1}{200}$ of their weight of sulphate of ammonia, and, in most cases, one or two thousandths are sufficient. A rapid and easy trial leaves not the slightest trace of ammonia in the purified acid, and shows exactly how much sulphate of ammonia must he added to the impure acid. Besides, even if a trace of ammonia did remain in the acid, it would he of no importance. At the present price of sulphate of ammonia, the purification of 100 kilogrammes of the sulphuric acid of commerce would not cost more than a penny or five farthings. Moreover, nothing need he changed in the present manufacture of this acid. All that is required is to add, when the acid is being concentrated, $\frac{1}{1000}$ or $\frac{2}{1000}$ of its weight of sulphate of ammonia. This salt is dissolved, and the operation is continued in the usual way.

The nitrous compounds with which the sulphuric acid of commerce is impregnated are the cause of the destruction of the platinum concentrating vessels; to their presence also must he attributed the alteration which indigo undergoes, the sulphuric solution of which is mixed with yellow matters, which are not formed when a purified acid is used. It is said, also, that the purification of oils does uot succeed so well when an acid containing nitrous compounds is used.

Hydrochloric acid, prepared by decomposing sea salt with sulphuric acid, necessarily contains chlorine or nitro-hydrochloric acid, which is a very great defect. These inconveniences, and many others which I pass hy in silence, do not exist when the mode of purification which I propose is used.

THE MIASMA OF AFRICA.—NIGER EXPEDITION.*

BY PROFESSOR DANIELL.

At the Royal Institution, Mr. J. F. Daniell read a paper "on the spontaneous evolution of sulphuretted hydrogen in the waters on the western coast of Africa and eslewhere."

He commenced by observing, that this subject was now interesting on two accounts — first, because it would recall to the members of that institution the experiments of Sir Humphry Davy on the subject, and which led him to advise the adoption of ship protectors; and, second, in consequence of the Niger expedition, fitted out to visit and endeavour to introduce civilization on the western coast of Africa.

The effect produced on copper sheathing by the presence of sulphuretted hydrogen in the waters on that coast, was, he premised, well known to every one informed

* *The Times*, June 5, 1841.

respecting vessels visiting it, and it was a fact that a cruise of nine months on the western coast of Africa injured the copper sheathing of a vessel as much as four years' wear in any other part of the world. The lecturer showed a piece of sheathing taken from the bottom of a Government frigate that had not been many months on the African station, and also a piece from the Royal George, sunk at Spithead, and which had been under water 60 years; the former was eaten through in very many places, and so thin all over that he might push his thumb through it, while the latter was tough and in excellent condition. His attention had been directed to the subject by the Lords of the Admiralty sending him 10 bottles of water, from as many different places on that coast, extending from 8° north of the Equator to 8° south, to analyse, and to report on the component parts thereof; and the accompanying table was the result:

	Sulphuretted Hydrogen. CUBIC FT.	IN.	Saline Matter. GRAINS.
Sierra Leone, per gallon	6	18	1,696.0
Volta . .	6	99	2,480.0
Bonny River .	1	21	1,778.0
Moony . .	..	..	2,104.0
Gaboon . .	..	..	2,169.0
Lobez-bay .	11	69	2,576.0
Congo River (Mouth)	0	67	188.0
Congo River (35 m. inland)	..	..	8.0
Bango . .	4	35	2,736.0
Lagos . .	14	75	1,920.0

All the bottles were hermetically sealed, and he had no doubt the water was in every way as good as when taken from the rivers. On drawing the cork, he was immediately struck with the smell of sulphuretted hydrogen, and adopted the general idea that it arose from animal and vegetable decomposition, but it had since appeared to him that such was not entirely the case. The gas extended a distance of 15° or 16°, and in some places as far as 40 miles to sea, covering therefore a space of 40,000 square miles. Now what could the origin be? He thought that it arose from the action and re-action of vegetable and animal matter brought from the interior by the rivers upon the sulphates in the sea-water. With this idea he gathered last autumn some leaves from a shrubbery and put them into three jars; into one of which he poured some plain New River water; into the second, some of the same water in which three ounces of common salt had been dissolved, and into the third, the like water, in which some crystallized sulphate of soda was dissolved. To the covers of the jars he fixed inside some litmus paper, and placed them in a cupboard, the temperature of which varied from 70 to 100 or 110 deg. The effect was, that in the first the litmus paper was perfectly white, and the smell by no means unpleasant; in the second the paper was quite white, and the smell similar to that of a preserve; but in the third jar, in which a sulphate was present, the paper was nearly black, and the stench was horrible and nauseous in the extreme, as every one knew the smell of sulphuretted hydrogen gas to be. Now sea-water contained sufficient sulphates to produce this effect, under peculiar circumstances.

But a more interesting part of the subject was the miasma so injurious to life on the marshy shore of Western Africa. Some persons said that if science cannot point out a remedy, it is useless to investigate the causes, but he did not so think; if science could not point out a remedy, still it could point to something as a palliation of the evil. The presence of the injurious gas was easily tested by the roughest hand, so that places in which it abounded could be avoided; and if imperative duty rendered it absolutely necessary to go to those places, then plentiful fumigations of chlorine gas would effectually destroy the sulphuretted hydrogen, The effect of this gas was not only visible on the Western coast of Africa, but in many places elsewhere, although not to so great an extent. Might not the jungle fever of India, the periodical fevers of New York and Charleston in America, and the minor diseases on the coast of Essex, be traced to be effects of this deleterious gas? It was a well known fact that the ships in the mouth of the Medway consumed more copper than other ships.

Chlorine gas then destroyed the injurious gas, and it was easily made, and the materials very cheap; the Government had plentifully supplied the African Expedition with the materials necessary for the most perfect chlorine fumigations, and he had the pleasure of believing that his report founded on the analysis of the waters submitted to him, and the precautions taken, had imparted confidence not only to the gallant men who composed that expedition; but also to those who had interested themselves in its welfare, and who had been actuated by the most Christian spirit. He hoped its success would be commensurate to its deserts.

EXPERIMENTAL RESEARCHES ON THE PRODUCTION OF SILICON FROM PARACYANOGEN.

BY SAMUEL BROWN, M.D. EDIN.

In a former paper, this distinguished chemist intimated that he had been led to infer from experiment, that two familiar substances, long universally regarded as distinct elements, are in reality only modifications of

* *Edin. Monthly Journal of Med. Science*; June, 1841.

the same material form; and having extended his inquiries, he now maintains that carbon and silicon are isomeric substances. The present communication is of a purely practical character, the author having refrained from presenting what he conceives to be the rationale of the singular facts he has just discovered, until farther investigations of a similar kind shall have been executed by himself and others. The manner in which the author establishes the isomerism of carbon and silicon is very simple, and consists in giving a great many processes by which the former may be converted into the latter. These are contained in a series of five sections: the first treats of the production of silicon from free paracyanogen, (N, C, C+N; C, C); the second, on the formation of mixed siliciurets of copper, iron, and platinum, by the re-action of paracyanogen; the third of the quantity of nitrogen separated from paracyanogen, when it is changed into nitrogen and silicon; the fourth describes processes for the preparation of transparent crystallized siliciurets of iron from the paracyanide of iron, and the ferrocyanide of potassium; and the fifth gives easy processes for the extraction of silicic from the ferrocyanide of potassium by the action of carbonate of potassa. It is impossible to convey an adequate conception of the manner in which those subjects are handled in the respective sections, in the form of an abstract. Suffice it that the author, having procured silicon, siliciurets, and silicic acid, in circumstances which appear to warrant the conclusion that the carbon of the compounds employed, had been tranformed into silicon, his chief care was bestowed on the attempt to discover some source of fallacy in his processes, *but in vain*. For example, one of the processes given in the last section is this: — Mix equal weights of anhydrous ferrocyanide of potassium and carbonate of potassa, and keep the mixture five hours (for 2000 grs. of the ferrocyanide) at a good heat in a well closed crucible of hammered iron; the product yields to water a mixed solution of cyanide of potassium, undecomposed carbonate of potassa, and silicate of potassa. The silicic acid may be separated by adding excess of hydrochloric acid, desiccation, ignition, and elutriation. But we must refer to the paper itself, about to be printed in the Transactions, for numerical and other details. It may be added, however, that the proof that the silicon of the silicic acid procured in the process which has just been mentioned, is not extracted from the iron crucible, is *twofold*; first, carbonate of potassa may be employed *alone* without producing any silicate, and that in the same crucible before and after the operation has been performed with the ferrocyanide of potassium; and secondly, the process may be repeated many times in the same crucible, and yet be invariably attended with the same result.

ON THE ATOMIC WEIGHT OF URANIUM.*

BY M. EUGENE PELIGOT.

Uranium, although it has been known for more than half a century, has been the subject of but few investigations: the properties of this metal are ill defined, although it presents many peculiarities worthy the attention of chemists.

Having at my disposal a great quantity of uranite, for which I was indebted to the kindness of M. Fontenay, proprietor at Autun, I undertook to study the principal compounds which this body produces. It is well known that the uranite of Autun is a double phosphate of uranium and lime, which, from its simple composition is better adapted than any other natural product for the extraction of this metal.

According to Arfwedson's experiments, confirmed by those of Berzelius, the atomic weight of uranium is represented by the number 2711·3. "This metal," says M. Berzelius, "has two oxides in which the multiples of oxygen are 2 and 3. There is reason to regard these oxides as U+O and 2U+3O, because uranium, although its specific gravity is not very great, has a very high atomic weight."

As this atomic weight was fixed without the analysis of one of the salts formed by this metal having been made, I considered that it was necessary, in commencing these investigations, to determine the elementary composition of some of them: the acetate of peroxide of uranium appeared to me to be best for this purpose. This salt crystallizes in small transparent isolated prisms, easy to be freed of their mother water; its physical characters cannot leave any doubt of its homogeneity.

The analysis of this salt gave:—†

	1st experiment.	2nd experiment.
Carbon	11·27	11·30
Water	21·60	21·16
Peroxide of uranium..	67·30	

* *Comptes Rendus*, No. 17, April 26, 1841.

† The following are the details of the analysis:—

1st Analysis.	2nd Analysis.
2·000 acetate of uranium.	1·413 acetate of uranium.
0·433 water.	0·586 carbonic acid.
0·827 carbonic acid.	0·309 water.
0·854 acetate of uranium.	
0·575 yellow oxide.	

The determination of the carbon and water was made by using the process indicated by MM. Dumas and Stass. (See *The Chemist*, Vol. I. No. XI. page 329, and No. XV., page 65.)

Now, admitting that the salt analysed contained 1 equiv. of acetic acid and 2 equiv. of water, and adopting the atomic weight of carbon of MM. Dumas and Stass to ascertain, by calculation, that of oxide of uranium, it will be found that it may be represented by the number 1800, as the following formula expresses:—

C^8	300·0	11·26
H^{10}	62·5	21·09
O^5	500·0	
Oxide of uranium..	1800·0	67·65
	2662·5	100·00

As it is very probable, from analogy, that this acetate may contain a base containing 100 parts of oxygen, the atomic weight of uranium, if these experiments are accurate, should henceforth be represented by the number 1700.

The formula of the salt analysed would be therefore

$$C^8\,H^6\,O^3,\ UO,\ 2HO\ ;$$

while, according to M. Berzelius, it is represented by

$$3(C^8\,H^6\,O^3,\ 2HO)\ U^2\,O^3.$$

I should also remark that this formula requires that 100 of acetate should yield 68·8 of oxide of uranium, 10·8 of carbon and 21·4, numbers which differ so much from those furnished by direct experiment, that it is impossible to adopt them.

The analysis of crystallized nitrate of uranium led to the same conclusions: the composition of this salt, of which I directly determined the nitrogen, water and oxide of uranium, would be represented by the formula

$$NO^5,\ UO,\ 6HO.$$

If the peroxide of uranium is U O, the protoxide would probably be U^2 O. Uranium, therefore, would present the same relation in its degrees of oxidation as copper.

The composition of this protoxide, which was directly ascertained by Arfwedson, by reducing that oxide with hydrogen, certainly does not agree with this supposition: that chemist found that in it 100 of uranium are combined with 3·55 of oxygen, whilst, according to the atomic weight deduced from the above analyses, 100 of uranium should take 2·90 of oxygen.

But Arfwedson himself remarked that his experiments were deficient: it is not probable that he had obtained pure protoxide of uranium; for this body has a great tendency to peroxidize, and it does not appear that Arfwedson took account of this circumstance. Besides, the composition assigned by this chemist to the peroxide does not quite agree with those which result from the modification that I propose for the atomic weight of the metal. Indeed 100 of uranium are combined with 5·53 of oxygen in the peroxide, if the old atomic weight be admitted: with the new, 100 of uranium take 5·80 of oxygen to produce the same body.

I hope soon to present to the Academy a work on Uranium, in which these various questions will be directly resolved.

A NEW CHLORIDE OF BARIUM, WITH A PROCESS FOR OBTAINING THE PROTIODIDE OF BARIUM.*

BY REUBEN PHILLIPS.

The perchloride of barium may be procured by neutralizing the peroxide of barium with dilute hydrochloric acid, and dissipating the water by heat. It is a white substance, and not deliquescent; it evolves chlorine at a red heat, being converted into the protochloride. When concentrated hydrochloric acid is poured on it, chlorine is disengaged. Hydriodic acid also decomposes it; ammonia separates from its aqueous solution hydrated peroxide of barium. If a solution of perchloride of barium be mingled with a solution of iodide of potassium, no decompositions take place; but if a small quantity of hydrochloric acid be added, so much diluted as not to act on the pure perchloride, reciprocal changes of constitution instantly ensue, and iodine is abundantly precipitated.

This fact, as well as the decompositions effected by the hydriodic and hydrochloric acids, appear to favour the notion, that the peroxide of barium dissolves in hydrochloric acid without decomposition, and that it is the oxygen of the peroxide that deprives the hydracids of their hydrogen.

The protochloride of barium when dissolved in water, is completely thrown down by concentrated hydrochloric acid.

The periodide of barium is not so easily formed, for on pouring dilute hydriodic acid on the peroxide, a decomposition succeeds, whence results much of the protiotide: that the fluid contains some of the periodide is, I think, certain, from its precipitating iodine on the addition of hydrochloric acid; on evaporating the water by a steam heat it becomes simply protiodide of barium.

The following is my process for obtaining protiodide of barium:—

Add water to the sulphuret of barium, and continue to add iodine, and to stir the mixture until the fluid is slightly colored with a small quantity of free iodine. The solution

* Communicated by the Author.

should not be too concentrated, as it is then apt to retain traces of sulphur. After it has been filtered, the water may be driven off by heat. This method is probably applicable to all the soluble sulphurets, and doubtless, bromine may be substituted for iodine.

At a heat below redness, oxygen separates iodine from the iodide of barium, producing the peroxide. Peroxide of barium, iodine, and water do not act on each other.

NEW TEST FOR NITRIC ACID.

To the Editors of The Chemist.

Brunswick Square, May 6, 1841.

Gentlemen:—

I send you a short account of a new test for nitric acid, which I proposed some time ago; but not having had time to publish it before, I take this opportunity of making it public through the medium of your valuable journal, if you think it worthy.

The substance I propose is a double salt, which I call the *cyano-hydrargyrate of iodide of potassium*. It is formed by mixing cyanuret of mercury and iodide of potassium together in their equivalent proportions, and dissolving the salt in small quantities of warm water, which on cooling, deposits the salt in beautiful plates.

The use of this salt as a test depends upon the fact, that if one of its scaly crystals be put into most acids it immediately becomes of a beautiful red, being changed into biniodide of mercury, while in concentrated nitric acid, of specific gravity 1·4 to 1·5, the scale instantly becomes almost black, from the liberation of iodine. The effect is visible upon a very small scale of the salt. The acids which have been found to redden this salt, are the sulphuric, muriatic, hydrofluoric, chromic, phosphoric, and the common vegetable acids.

It has been found to blacken with chlorine, bromine, sulphuretted hydrogen, nitrous acid, &c.

The method of detecting the presence of a nitrate is to evaporate the solution to dryness, to introduce a small portion of the residue into a small tubulated retort, and pour upon it one or two drops of sulphuric acid, and apply a gentle heat, when a portion of the volatile products will pass over into the receiver with which the retort is to be connected, and in which one or two crystals of the salt have been placed. If they are blackened, the salt is to be considered a nitrate, provided the presence of those few substances which might cause the same effect has been guarded against.

By the method proposed, the presence of this acid will be at once detected; for the color of a chromate, the evolution of peroxide of chlorine from a chlorate, the liberation of iodine from an iodate, and the odour of a sulphuret, will at once decide with regard to each. I have tried this method of detecting nitric acid, and I am of opinion that it is quite as much to be relied on as the other tests, and indeed, provided all sources of error are avoided, I think it is superior to them.

I am, Gentlemen,
Respectfully yours,
C. W. B. A.

INVESTIGATIONS CONCERNING ESSENCE OF TARRAGON.*

BY M. A. LAURENT.

Crude essence of tarragon almost entirely consists of an oil which is volatile without decomposition. Its composition may be represented by the following formula:—

$C^{64} H^{40} O^3$ = 4 vol. of vapour.

Submitted to the action of boiling nitric acid, it yields the three following acids:—

Draconic Acid.—Crystallized in beautiful colorless prisms, volatile without decomposition. Its formula is

$C^{64} H^{26} O^{10} + 2$ Aq.

The two atoms of water may be substituted by two atoms of any base. This composition shows that the essence of tarragon has changed 7 equiv. of hydrogen for 7 of oxygen.

Nitro-draconasic Acid. — This body, which is crystallized and partly volatile, without decomposition, may also be obtained by boiling draconic acid with nitric acid. Its formula is

$C^{64} H^{24} N^2 O^{14} + 2$ Aq.

It represents draconic acid, one equivalent of whose hydrogen has been substituted by one equiv. of hyponitric acid.

Its two atoms of water may be substituted by two atoms of base.

Nitro-draconesic Acid.—It resembles the preceding: some of its salts catch fire in close vessels, when heated. Its formula is

$C^{64} H^{22} N^4 O^{18} + 2$ Aq.

It represents draconic acid, of which two equivalents of hydrogen have been replaced by two of hyponitric acid.

The two atoms of water may be replaced by two of base.

These three acids resemble one another in the highest degree; almost all their salts have the same solubility, and it is not without difficulty that they can be separated from one another.

Essence of tarragon, submitted to the action of chlorine, gives rise to an oily matter, which I call chloride of draconyle. Its composition is represented by the formula

$C^{64} H^{30} O^3 Cl^{14}$.

* *Comptes Rendus*, No. 18, May 5, 1841.

It shows that the essence of tarragon has changed 5 equiv. of hydrogen for 7 of chlorine.

I have proved in different memoirs that when a compound changes hydrogen for a greater number of equivalents of chlorine, a quantity of chlorine, or chlorine and hydrogen, may always be removed, either by distillation or by the alkalies, or that the new product contains as many equiv. as the body which gave rise to it. The action exerted by potassa on chloride of draconyle confirms this opinion. Indeed, I obtained chloride of potassium, and a new oil, which I call *chlorodraconyle*, and whose composition is represented by

$$C^{64}\ H^{28}\ Cl^{12}\ O^{3};$$

that is, essence of tarragon of which 6 equiv. of hydrogen have been replaced by 6 of chlorine. Nitro-draconesic acid is isomorphous with draconic acid; the following formulæ, therefore, must be adopted for the preceding bodies:—

(I employ equivalents, and represent hyponitric acid by X.)

Essence of tarragon . .	$C^{32}\ H^{20}\ O^3$.
Chloride of draconyle . .	$C^{32}\ (H^{15}\ Cl^5)\ O^3 + Cl^2$.
Chloro-draconyle . . .	$C^{32}\ (H^{14}\ Cl^6)\ O^3$.
Draconic acid	$C^{32}\ (H^{13}\ O^7)\ O^3 + 2$ Aq.
Nitro-draconasic acid . .	$C^{32}\ (H^{12}\ X\ O^7)\ O^3 + 2$ Aq.
Nitro-draconesic acid . .	$C^{32}\ (H^{11}\ X^2\ O^7)\ O^3 + 2$ Aq.
Salts of silver	$C^{32}\ (H, X, O,)^{20}\ O^3 + 2$ Aq. O.

II. CHEMICAL MANUFACTURES.

SULPHURIC ACID, CONTAINING ARSENIC.

Sulphuric acid, made from iron pyrites, contains a quantity of arsenic, amounting to thirty or more grains in the pint. We have received numerous communications from the most authentic sources, informing us of the existence of the deadly practice of manufacturing sulphuric acid from this impure substance, which always contains arsenic in such quantity as to render the acid highly poisonous.

It is some two or three years since a patent* was taken out for making sulphuric acid from pyrites, and we are informed it is in use chiefly in Wales and in Scotland, where it is found in large quantities, and is very cheap.

Sulphuric acid, it is well known, is largely employed in the arts and manufactures, as well as in many processes connected with the production of domestic and medicinal compounds. One of its most extensive uses is the manufacture of soda, and as this is frequently used in culinary purposes, and given as medicine, some portion of arsenic it is probable may be contained in it, and prove of the greatest injury. Sulphuric acid is likewise very extensively used in producing soda-water, as it is termed, for which purpose it is of the greatest importance it should be perfectly free from so injurious a substance.

We have merely advanced enough to caution our readers, and the public, against procuring sulphuric acid from any manufacturers who use pyrites in the process of obtaining the sulphate for this purpose.†

The methods of testing the acid are to dilute it, and subject it to the action of zinc in Marsh's apparatus, and to ignite the hydrogen gas as it escapes from the end of the tube. If the gas deposits any metallic spots, such as have been frequently described in *The Chemist*, upon the plate or glass, the acid must have contained arsenic, which has passed over in the form of arseniuret of hydrogen.‡

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* As all patents are granted upon the condition that they are useful to the public, and this patent being not only not useful but dangerous, is such patent valid, and ought it to be suffered to be employed? If any more of the acid is sent to us, and is found to contain arsenic, we shall send it to the proper quarter to stop the nuisance. Soda powders, &c. are made in large quantities with the bi-carbonate of soda, and as the whole of the arsenic probably is not expelled with the hydrogen given out in decomposing the sulphate of soda, some arsenious acid may be contained in this preparation of soda, and become highly prejudicial to health.

† No doubt it is a fine speculation to get sulphur at a cheap rate from iron ore, though it may contain in a pint of acid as much arsenic as would kill a dozen people. We shall keep our eye upon the matter.

‡ Of course, as directed in all other cases, care must be taken to test the zinc before the acid is examined.

ON THE USE OF CARBONATE OF ZINC AS A PIGMENT, AS A SUBSTITUTE FOR WHITE LEAD.*

The great number of workmen who have been attacked with lead colic, through working in white lead manufactories, the death of some of them, and the symptoms observed in persons inhabiting apartments recently painted with white lead, have long attracted the attention of manufacturers and medical men, and we have been asked whether it would be possible to make use of the zinc residue, which might be procured very cheap at the place where the smelting of that metal is carried on, to obtain from it :—1st, hydrogen gas, which, by several chemical operations, could be rendered fit for lighting; 2d, sulphate of zinc, thus obtained very cheap, which might be converted into carbonate of zinc, to be used in painting.

The idea of substituting this salt for that of lead, which was published in the English work of Mr. Turner Thachrach, had already been published by the French philanthropists, and on a further examination into what has been done on this subject, we find that M. Courtois presented to the Academy of Dijon,† through M. Guyton de Morveau, some white zinc which, according to that chemist, possessed the following properties :—

It was unalterable, even by the strongest vapours (we understand by that, hydrosulphuric acid or its compounds), which immediately blacken Kremlitz white and every other species of white lead; it did not possess any of the bad qualities of the oxides of lead. It is known that the salt of zinc may be taken internally. White zinc mixes well with all colors, and may be used with both oil and water colors. It is remarked that it has the advantage of using less oil, and drying quicker than white lead.‡

Carbonate of zinc may be prepared in various manners.

1st. By precipitating a solution of sulphate of zinc by an alkaline carbonate; this process is followed in England in many manufactories; but as the sulphate of zinc of commerce is very impure, before employing it, its solution must be boiled with powdered or granulated sulphate of zinc: thus any metallic salts that this salt may contain, and which might injure its color, are decomposed; such as the sulphates of copper and iron, which it ordinarily contains.

2d. By calcining the sulphate of zinc in a crucible, the sulphate of iron, which is more easily decomposed, is converted into the insoluble sulphate of the peroxide and a small quantity of neutral sulphate of iron; but, as a small portion of oxide of zinc is separated at the same time, when the calcined mass is boiled in water, the oxide of zinc, which had been preipitated, reacts on the neutral sulphate of iron, combines with its sulphuric acid, and precipitates the oxide of iron. It is then filtered and precipitated by sub-carbonate of soda.

3d. By dissolving sulphate of zinc in a small quantity of water, adding a little nitric acid, and boiling it for a quarter of an hour, to peroxidize the iron, which is thus precipitated, cooling the liquor, treating it by an excess of carbonate of lime, leaving it for twenty-four hours in contact, filtering it and precipitating by sub-carbonate of soda.

Carbonate of zinc is also prepared in Germany; the following process is due to Herr Hermann :—

Zinc, or oxide of zinc, is treated by sulphuric acid: the solution is then subjected to the action of sulphuretted hydrogen, then treated by hydro-chlorate of lime; it is concentrated to separate the sulphate formed, and the hydro-chlorate of zinc which remains is precipitated by sub-carbonate of soda. The carbonate of zinc thus formed is washed and dried.

Other details on this subject are also found in printed works. There exist observations on carbonate of zinc, by M. Vincent de Montpetit, and a Report of the Committee of the Academy of Architecture, which we will give here.

OBSERVATIONS ON CARBONATE OF ZINC PROPOSED TO BE USED FOR PAINTING THE INTERIOR OF BUILDINGS INSTEAD OF WHITE LEAD.

BY M. VINCENT DE MONTPETIT.

It has long been known that oil painting in the interior of buildings has been the cause of diseases which have often proved fatal, and among others that known by the name of painter's cholic, the principal cause of which is owing, it is said, to the miasma emanating from the lead and its various compositions: it has also been ascertained that the white paints made from it give out vapours which are injurious not only to the workmen, but also to those who inhabit close places which have been recently painted.

It was therefore interesting to endeavour to substitute less deleterious substances for white lead: carbonate of zinc obtained the preference on account of its whiteness and its not being liable to alteration of color. The experiments which were repeated on this subject were submitted to the Royal

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* *Journal des Connaissances Necessaires et Indispensable; May*, 1841.

† A proof of this fact may be found in the *Tableau Raisonné de l'Histoire Litteraire du Dix-huitième siècle, Dec.* 1782, p. 146.

‡ It is said, however, that it does not cover so well as white lead.

Academy of Architecture, whose authentic approbation ought to excite the attention and confidence of the public in favour of this new pigment, inasmuch as it has been proved that it cannot, under any circumstances, give off vapours which are prejudicial to health.

It may, therefore, on account of its utility, be recommended to society. Unfortunately, its use is not yet very general, because at present, it is manufactured only in the chemical laboratory of the Academy of Dijon, and because it cannot be very cheap, as the material is brought from abroad. If the French mines were examined, those of Saint-Bel, in Lyons, of Pompeau, in Brittany, and others, in which zinc is found in great abundance, and if, instead of neglecting them, they were used for making carbonate of zinc, this would be the best means of turning it to account, and of opening a new branch of commerce, which would keep in the country a portion of the large sums of money sent abroad to buy white lead.

It would be highly advantageous, for humanity as well as commerce, to establish a manufactory combining all the means required for bestowing on the different classes of society the benefits resulting from the use of carbonate of zinc; for at the present time (1786), it is attainable only by the rich. The price of 4 francs per 500 grammes (one pound French) will always be an obstacle to its general use. It is, however, apartments whose interior should be painted with carbonate of zinc, such as those of vessels, ground-floors, habitations exposed to damp, and others, where a durable paint is desired.

REPORT OF THE COMMITTEE OF THE ROYAL ACADEMY OF ARCHITECTURE.

The committee appointed by the Royal Academy of Architecture, at its sitting of March 13, 1786, having examined a memoir of M. De Montpetit on the advantages of substituting carbonate of zinc for white lead in painting, made the following report: —

"The prejudicial effects of the various preparations of lead in oil and colour painting are well known. It appears to us that nothing ought to favor the employment of a substance which renders apartments injurious to health for a very considerable time, and whose effects, although slow, and often attributed to other causes, are not the less real and terrible when they attack persons of a weak and delicate constitution; but it is wished to please the eye, and that at as low a price as possible. Hence, it is that from preference the use of white has so long been continued, notwithstanding the danger.

"We are indebted to M. Morveau for numerous and interesting experiments on carbonate of zinc. They were made at the Academy of Dijon, and repeated at Paris. It may be concluded from these experiments, whose results were exhibited to the company, that carbonate of zinc has two very great advantages over white lead.

"The first is, that it contains no substance whose emanations can be injurious to health; the second, that it always retains its brilliancy and whiteness, because experiments made by exposing it to the vapour of sulphur, showed that it could not be altered by substances which evolve hydro-sulphurous vapours.

"Indeed, it yields in whiteness to the best white lead; but this advantage is of no great consideration, since the best white lead is always susceptible of being reduced, and of acquiring a blackish tint on contact with any substance containing sulphuretted hydrogen, and since it costs 5 or 6 francs per pound. (In 1786).

"The specific gravity of the carbonate of zinc must be taken into consideration; that salt, costing only 4 francs per pound, covers at least one-third more surface. It is evident, therefore, that on account of its durability, there will always be a real advantage in employing it, even at the present price.

"We cannot dissemble that the difference of the price of white lead and carbonate of zinc for painting buildings does not raise the price of the same surface in the proportion of 1 to 3, and that this proportion is no less unfavorable to white lead; but as it must be observed that we gain in whiteness, and that this difference is greatly owing to the present price of zinc, there is every reason to hope that this price will be considerably lowered if a large establishment be formed. Such an establishment would be very useful and agreeable to those who know the value of health, and how much we ought to desire to see the number of causes which tend to injure it diminished.

"Moreover, it might reasonably be expected that new combinations of this pigment with other substances will diminish the expense of painting buildings, provided these mixtures be made with the care and precautions prescribed by M. Montpetit.

"We think, therefore, that we cannot but praise the zeal of the author of this memoir, in repeating the interesting experiments of the Academy of Dijon. Besides, as we have in this kingdom mines where zinc is found in abundance, it would open a new branch of commerce and national industry, that of favouring the manufacture, on the large scale, of this salt, which has none of the objections to which the preparations of lead are liable. It cannot be doubted that one should hasten to adopt it in all cases

even if works on a large scale should reduce the price of the preparations of lead in use under the same circumstances.

"Thus we think that the Academy will adopt the praises which we think due in all respects to the useful views and multiplied works of the author of the memoir.

(Signed) Mauduit.
Bossut.
Cherpitel Antoine."

Again, quite recently (in January, 1841,) we were in a situation to prove the action of sulphuretted hydrogen and the hydro-sulphates on oil paintings, and particularly in that applied in the neighbourhood of Montfaucon: painting of a greyish white had first turned black, then scaled and was partly detached: the parts which did not fall were removed, and presented on the two surfaces swellings and furrows so strongly marked, that it might, at first sight, have been taken for a product obtained by fusion. Submitted to the action of heat, we first obtained products analogous to those of painted wood when burned and afterwards treated by sulphuric acid.

In conclusion, without thinking that carbonate of zinc may be entirely substituted for carbonate of lead, we do think that it might be very useful in oil preparations.

INDELIBLE INKS.

To the Editors of The Chemist.

Gentlemen:—

The perusal of a letter in No. XVII. of your journal, containing a formula for the preparation of the Marking Ink of the shops, has suggested the idea, that a short paper on the subject, may prove interesting both to the trade and the public.

The fluid spoken of by your correspondent is simply a solution of the oxide of silver in liquid ammonia, to which a little coloring and gum are added, for the purpose of rendering the marks of the pen legible, before the ammonia is volatilised, and to prevent the surface of the writing from spreading. The proportion of each article is of little consequence, the necessary qualities being—sufficient fluidity to run easily from the pen, and a good depth of color after exposure for a few days. This preparation has, however, no claim to the title of "Indelible Ink"—"which no art can extract without injuring the fabric"—as is generally represented. On the contrary, it may be discharged with almost as much facility as a common iron-mould. This may be easily and cheaply effected with either chlorine or ammonia, without in the least injuring the texture of the fabric to which it may be applied. From a great number of experiments which I have lately made on the subject, I find that this ink may be discharged from even the finest muslins, without impairing their quality. The only precaution required, is that of rinsing them in clean water, immediately after the operation.

Another preparation which was formerly the only marking ink of the shops, and which is, even now, frequently met with, consists of a solution of nitrate of silver in distilled water, in the proportion of one part of the former to five of the latter, by weight, and, like the previous article, is colored with sap green, and thickened with gum. Before writing with this fluid, the linen is to be prepared with a weak solution of carbonate of soda slightly stained with sap green or syrup of buckthorn, to which a very minute quantity of mucilage is added. In many points this ink is much superior to the former, as it spreads less, and unites itself more firmly to the fibres of the linen, but like all writing fluids of this description it may be easily discharged, in the way before mentioned. It is difficult to conceive the reason why the trade and the public entertain an affection for such expensive preparations. A solution of indigo or ferrocyanide of iron is much more permanent, and much less expensive, while even common black ink or copperas water will impart a stain capable of resisting the action of the alkalies and soap employed by the laundress, and would consequently prove equally useful with the nitric solution, if this be the only quality required in common marking ink. I have an article of dress, that was prepared with a mordant of protosulphate of iron, and afterwards written on with a solution of ferrocyanide of potassa, and which has been subjected to repeated washing and boiling, without at all impairing the colour of the writing. The juice of sloes, thickened with a little gum, is also an old form, and very durable. But none of these fluids, or any others of a similar description, can lay claim to the title of "indelible."

If we want an ink capable of resisting the action of the usual chemical agents, either for the purposes of the manufactures and arts, or preventing fraud, we must seek for other preparations than mere metallic or vegetable solutions. This property will be found in a composition first recommended by M. Haussman, and which is permanent under the action of chlorine, the alkalies and the acids, even in a state of considerable concentration. It is extensively employed in the arts, and has been found capable of resisting all the operations of dyeing and bleaching, and at once offers a cheap and excellent material for marking linen, &c. This ink is formed by dissolving one part of genuine asphaltum in four parts of oil of turpentine, and adding to the mixture a sufficient quantity of lampblack, or finely pow-

dered black-lead, to render it suitable for printing. The plan of marking with stamps or types is much neater than the common method of employing a brush or pen. Mr. Sheldrake has proposed a similar mixture, but prepared with amber varnish instead of turpentine, or a mixture of the two.

The following formula has been constantly given in chemical books, and is highly recommended by Mr. Close, but is very expensive.

Take powdered copal, 25 grs.
Oil of lavender, 200 grs.
dissolved by a gentle heat; then add
Lampblack, 2½ grs.
Indigo, ½ gr.

A larger quantity of colour than here mentioned improves the ink.

Another formula on the same authority is

Powdered copal, 1 part
Vermillion, 4 ,,
Oil of lavender, 7 ,,

All these preparations are strictly "Indestructible Inks," as far as the term may be reasonably applied, and whether employed for lables for bottles containing caustic fluids, or for marking textile fabrics, will sufficiently bear out the title. It must, however, be confessed, that the last two recipes, though so much esteemed by many persons, possess no advantage over the simpler and cheaper ones formed with asphaltum: in fact, they are inferior in many respects. I feel much pleasure in stating, that from my own experience, I can confidently recommend the formulæ of M. Haussman and Mr. Sheldrake, as possessing every necessary quality.

I have also employed a mixture of the following materials with great success:—

Asphaltum, 1 part.
Oil of turpentine, 3 ,,
Best Printer's Ink to colour.

But I fear I am trespassing too far on your columns, and will therefore conclude. At some future time I may notice the preparation of writing fluids for paper and parchment.

I am, Gentlemen,
Respectfully yours,
A. J. Cooley.

London, June 3d, 1841.

ON THE PROCESSES FOR RENDERING TISSUES UNINFLAMMABLE.*

BY M. MORIN.

The idea that tissues might be rendered uninflammable by means of an incombustible mineral substance has long been entertained.

It has been ascertained that heat applied to an organic substance covered with an incombustible substance, acted by disorganizing it, as distillation in close vessels would do, and destroyed it.

But the necessary result of this destruction being the production of a large quantity of gases containing more or less carbon, and of a more or less combustible and inflammable nature, we cannot but doubt the real efficacy of the means employed for rendering the tissues uninflammable.

An opportunity of making some experiments on this subject having presented itself, I seized it with the more haste, as they were to be made on a large scale. The subject of the experiments was the sail of a steam-boat, exposed to the rain, and to receiving burning coals. It was a large hempen cloth.

At first I tried the effect of soluble glass charged with various proportions of silica, and among others I tried that of Fuchs, which was used for the decorations of the theatre at Munich, and which is soluble only in warm water.

A piece of stuff was impregnated with the vitreous solution, and dried. The same operation was repeated several times before it attained the point when, exposed to the action of a bright flame it reddened and was decomposed without being inflamed.

I found that by several times handling the stuff thus rendered uninflammable, it entirely lost this property, which I could attribute only to the vitreous covering with which it was saturated having dried and not having contracted any adhesion to the tissue, and being applied to it only like a powder which fell off every time it was moved.

It would, therefore, be interesting to know whether the management of the theatre at Munich has found it necessary to renew this vitreous solution in the decorations which are moveable, and, if not, whether they do not reckon on a property which these decorations no longer possess.

Once convinced that soluble glass had no other property than that of impregnating the cloth with a dry and friable mineral substance which may be detached under the form of a powder, it appeared to me that any concentrated saline solution with an insoluble base, and whose base might be precipitated on all the internal and external parts of the tissue, would produce analogous effects to those of soluble glass, and these means would have the advantage of economy and of facility of preparation for all moveable hangings and which are likely to be knocked about, however, acknowledging the superiority of soluble glass for all fixed objects.

If it had been required for cloth sheltered from the air, I could have dispensed with precipitating the saline solution. The

* *Journal de Pharmacie*, May, 1841.

salt lodged in all parts of the tissue would render it incombustible, and in support of this view, I may mention the difficulty experienced in burning wooden vessels which have contained salt, especially sea-salt containing muriate of magnesia, a deliquescent salt which easily penetrates into the pores of the wood.

Cheapness being a *sine quâ non*, the choice of substances which I could use was very limited.

I first tried alum. After having steeped the cloth in a concentrated bath of that salt, I dried it and immersed it in a very dilute bath of ammonia, to precipitate the alumina. I repeated this operation several times, and when I considered the cloth sufficiently charged with alumina, I dried it. Cloth thus prepared burned little less easily than before.

I succeeded no better by employing two successive baths of muriate of lime and carbonate of potassa, producing carbonate of lime by their decomposition.

From the very remarkable property of alum, of fixing colors on certain tissues, which, without that intermedium, would be destroyed or removed by washing in water, I had hoped to find in alumina in a body capable of contracting a certain adherence to cloth. This view not being confirmed, I gave up earthy preparations: I then tried metallic preparations, several of which form chemical compounds with most organic substances.

I first tried basic acetate of lead, and I effected the precipitation by three different bodies, namely; muriate of ammonia, ammonia, and alum. By the first process, I charged the cloth with muriate of lead, by the second, with oxide of lead, and by the third, with sulphate of lead.

These three samples, dried, did not inflame, although held for a long time in the flame; but they burned slowly, and when one part became incandescent, the fire was slowly propagated throughout the stuff, as well as prepared tinder would have done.

Finding in the preparations of lead but some of the properties which I required, and a very serious inconvenience, I tried zinc. After having charged the cloth with a large proportion of sulphate of zinc, I precipitated the oxide by ammonia.

The sample obtained did not inflame. It might be burned, but the combustion was not propagated unless it was supported by a fire.

Having found in oxide of zinc the properties which I desired, I adopted it on a large scale. The following are the proportions which I found best adapted:—

For 45 pounds of cloth, I employed 16 pounds of sulphate of zinc and 36 pounds of water, and I precipitated the oxide from it by 6 pounds and a half of ammonia, at 16 degrees, mixed in a large quantity of water in which I dipped the cloth several times. The tissue was covered with 5 or 6 pounds of oxide of zinc, or $\frac{1}{3}$ of its own weight.

This preparation, however, had the same defect as that which I had noticed above; and as the samples brought from Paris by M. de Saussure also presented, that of being washed out with water; a very serious objection, especially for a sail exposed to rain.

To fix the preparation of zinc, or anything else, in a more solid manner, I tried the property which tannin possesses of rendering gelatine insoluble. For this purpose, I first charged the tissue with the mineral substance to render it incombustible; then, after having dried it, I impregnated it with a solution of size, and finally I passed it into a bath containing tannin. Although the preparation for rendering the tissue uninflammable, was rendered more tenacious by these means, it did not resist repeated washing.

It is evident, therefore, that processes like those which I have pointed out, do not indefinitely preserve tissues exposed to wet, and that it is necessary now and then to replenish them with mineral matters to retain their incombustibility.

It is the same with tissues liable to be knocked about or folded. All these motions cause some of the mineral matter to fall off, and after a time, the tissue, being charged with too small a quantity of incombustible matter, can be inflamed. However, this is effected not so quickly as by washing.

For the preservation of fixed tissues, papers, or wainscots, the vitreous varnish perfectly answers the purpose.

In some cases, a deliquescent salt might be the most advantageously used; muriate of lime for example.

Finally, these different substances seem to have no other mode of action than by rendering the combustion so slow that the gases produced by the decomposition of the organic matter do not engender flame. We may conceive, therefore, that, by their agency, the organic matter will easily resist a feeble source of fire; that a spark or a hot cinder may make a hole in it, without causing the combustion of the whole. But if the source of heat be sufficiently strong to produce immediate decomposition of a great quantity of organic matter, the product of gas will, consequently, be considerable, and instantaneous, and the matter may even be inflamed. Uninflammability will not, therefore, be absolutely obtained, but it will be relative to the intensity of the source of heat.

COLORS OBTAINED WITH THE DAGUERREOTYPE.

To the Editors of The Chemist.

1, Castle-street, Dover, Kent.

GENTLEMEN:—

Permit me to trespass a little on your valuable space by informing you and your numerous readers that, after many months of expensive and repeated trials, I had the satisfaction, on the 23d of April last, to obtain three most distinct and perfect colors, by the Daguerreotype. But the process I employed being very different from that laid down by M. Daguerre himself, I beg to be permitted to call my new method "PHOTOCHROMY."

That what I advance may not be doubted, I beg to say that I showed my first successful result,—the Cottage in Eastbrook Place, occupied by Mr. George Jennings, a worthy magistrate of our town, which I took from my own drawing-room,—to the most celebrated chemist, and one of the best geologists of this town—I mean Mr. Dean, of Beach-street, and Mr. Lambert Weston, both of whom greatly admired this beautiful picture. Mr. Wright, the engineer at the railway office, a most scientific character, has also seen it. Should I be fortunate enough to obtain more of the colors, it will afford me pleasure at some future period to publish the process. It is more than a year since I obtained tolerable portraits from nature. The arrangement in the machinery being my own, I besitate not to mention a circumstance well known to some of my Dover friends.

Should this hasty communication be deemed worthy of insertion in your excellent publication, to which I am a subscriber, you are at liberty to do so.

I remain, Gentlemen,
Your humble and obedient Servant,
J. P. SIMON, M.D.

III. PHARMACY, &c.

LAWS OF THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN,

PASSED AT THE MEETING OF THE SOCIETY, HELD AT THE CROWN AND ANCHOR TAVERN, JUNE 1ST, 1841.

THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN is instituted for the purpose of uniting the Chemists and Druggists into one ostensible, and recognised, and independent body—for protecting their general interests, and for the advancement of Pharmacy, by furnishing such a uniform system of education, as shall secure to the profession and the public, the safest and most efficient administration of medicine.

CONSTITUTION.

The Members of the Society shall consist of,

1. Chemists and Druggists who are, or have been established on their own account, and who shall severally subscribe the sum of Two Guineas annually;

2. Confidential Superintendents, who shall be elected by the Council, and who shall severally subscribe the sum of Two Guineas annually.

(*The sum of Twenty Guineas, subscribed in one payment, shall be received in lieu of the annual subscription.*)

Honorary and Corresponding Members, comprising such medical and scientific men as have distinguished themselves in any of the branches of knowledge embraced in the Educational objects of the Society, shall be elected by the Council, but shall not be allowed to be present at any General Meeting.

Associates.

Assistants shall be admitted as Associates who shall pay the sum of One Guinea annually; and shall be entitled to all the benefits of the Society, excepting the right to be present at any of the General Meetings, or to hold any office in the Society.

Apprentices.

Apprentices who shall be duly registered, and who shall pay the sum of One Guinea annually, shall have the privileges of Associates.

EDUCATION AND EXAMINATION.

The Educational Objects of the Society shall embrace the followings subjects:—An Elementary Classical Education—Medical Botany—Chemistry—Materia Medica—and Pharmacy.

After the 1st of July, 1842, no person shall be admitted as a Member, or an Associate of the Society, without having passed an examination in the above branches of knowledge; and after that period no Apprentice shall be entitled to the privileges of an Associate without having, before the execution of his indentures, passed an examination in Classical Education. The said examinations and the registration of indentures shall be subject to the payment of such fees, and the granting of such certificates, as the Council may, from time to time, determine. But all present Assistants and Apprentices, who

shall be registered before the above date, shall he exempted from the above restrictions, and shall be eligible as original Members, when they shall have commenced business on their own account.

It shall also be in the power and discretion of the Council to admit as Members, without examination, after the above period (upon the payment of an entrance fee) such Chemists and Druggists as have been actually in business on their own account, prior to the above date, but who may have neglected to become Members.

ELECTION AND POWERS OF COUNCIL.

The government of the Society shall reside in a Council of twenty-one, composed of a President, Vice-president, Treasurer, and eighteen others.

The Council shall be annually elected by and from among the Members of the Society; one-third of which shall consist of Members of the last year's Council. The President, Vice-President, and Treasurer, shall be chosen by and from among the Council, who shall also appoint a Secretary, being a Member of the Society.

There shall also he elected, at the same time, by and from among the Members of the Society, Five Auditors; three of whom shall be required to inspect and sign the accounts, at least fourteen days previous to their being submitted at each Annual General Meeting.

Any Member desirous of nominating another to any office, must express the same in writing to the Secretary, at least six weeks before the day of election, being previously assured that such member named will accept the office, if elected.

The Council, of whom seven shall form a quorum, shall meet monthly, for the admission of Members and Associates and for the despatch of business; and shall keep a fair record of their proceedings; but Special Meetings may be held on the requisition of the President or any five Members.

The Council shall appoint Examiners and Lecturers, and shall regulate the extent of examination, as from time to time may he necessary; and shall provide a library, museum, laboratory, &c., as may hereafter become practicable, and shall render an account, once in every year, of the receipts and expenditure of the Society.

The Council shall have power to elect, as Members of the Society, such persons engaged as confidential Superintendent, as may, by their acquirements, be calculated to improve the art and science of Pharmacy, or advance the interest of this Society: they shall also elect Honorary and Corresponding Members.

The Council shall make such bye-laws as shall be requisite, and shall avail themselves of all practicable means for promoting the general interests of the Society, and protecting its members.

FINANCE.

The Funds of the Society shall be derivable from donations to General Purposes; Subscriptions of Members, Associates, and Apprentices, as well as fees upon examinations and registrations.

All annual subscriptions shall become due on the 1st of January; and if not paid hy the 25th of March, the defaulter shall cease to be a member: but the Council shall have power to re-admit, upon a reasonable explanation, and payment of a suitable fine.

The Council shall have power to disburse the funds of the Society in payment of salary to Secretary, fees to Lecturers and Examiners, Premises, formation and extension of Museum and Library, Philosophical and Pharmaceutical Apparatus, Laboratory, Premiums for discoveries in Chemistry, and improvements in Pharmacy, servants' wages, and any other requisites for accomplishing the objects of the Society.

The financial affairs of the Society shall be conducted by the Treasurer, who shall duly account to the Council, once in every month, or oftener if required, for all monies received and expended.

All monies or other property shall he vested in the Council.

THE BENEVOLENT FUND

Shall consist of donations and subscriptions made for that specific purpose, aided by such appropriation of a portion of the general funds as the Society at their annual meeting shall think necessary.

All distressed Members and Associates of the Society shall be entitled to relief at the discretion of the Council; and all distressed widows and orphans of Members and Associates shall he in like manner the objects of this fund.

GENERAL AND SPECIAL MEETINGS.

A General Meeting of the Members of the Society shall be held on the third Tuesday in May, in each year, to receive the report of the Council, and to discuss any matters of importance which may require the attention of the body at large; at which meeting the Council and Auditors shall be elected, by ballot, for the twelve months next ensuing.

The President or Vice-President shall act as Chairman of all public meetings; or, in their absence, the members then present shall elect a chairman from among the Council.

The Council shall call a special general meeting of the Members of the Society, whenever they shall see fit, or on the requi-

sition of thirty members, entitled to vote, and the Council shall give ample notice of the said meeting, and of the business to be considered. At such special meeting the only business, after the chair is taken, shall be the consideration of the special matter for which the meeting is called; but no member shall vote in any meeting, unless he shall have paid all subscriptions at that time due.

Any thirty members, duly qualified, desirous of expunging or altering a law, or proposing a new one, must deliver to the Secretary the proposition in writing, with their signatures attached, at least three months before the annual meeting next ensuing, and the Secretrary shall give one month's notice of such proposition to the members of the Society.

Report of the Committee upon the Laws of the Pharmaceutical Society of Great Britain.

Agreeably with your instructions, and in conformity with the principles laid down in the last Report, your Committee have prepared the fundamental Laws of the Pharmaceutical Society in such a manner as shall leave to every one, whether Principal, Assistant, or Apprentice, all rights and privileges enjoyed by his predecessors; whilst regulations are proposed which shall assure to the public and the profession, the competence of such Chemists and Druggists as shall be Members of this Society.

The unanimity which prevails among Chemists and Druggists upon the expediency and necessity of establishing an Association for the purpose of protecting their interests, induces the Committee to hope that the same unity of sentiment will prevail in carrying out the details of this important measure.

The influence which Chemists and Druggists possess as a body when their efforts are combined, has been demonstrated in a manner which affords every encouragement to perseverance. It is equally manifest that if they relax in their exertions, or allow any minor considerations to interfere with the zealous and harmonious performance of the duty which they owe to themselves, they will inevitably sacrifice their independence, and be deprived of many of their existing privileges, by becoming subject to extraneous jurisdiction. It must be recollected that the Society is of a PUBLIC nature, and involves the prosperity of Chemists and Druggists as a body throughout the kingdom. It is only by the combined and continued efforts of individuals that a scheme so comprehensive and laborious can be effected; and these efforts to be successful, must be supported by all those who are interested in its accomplishment.

In drawing up the fundamental regulations of the Society, your Committee have carefully guarded against the possibility of those abuses which have often arisen in similar institutions; and, while they have vested in the Council sufficient powers to render their services effective, they have made them entirely responsible to, and to be elected by the members at large.

To Chemists and Druggists now established, this Society offers the means of extending Pharmaceutical knowledge by the establishment of a recognised medium through which discoveries and improvements may be promulgated; whilst the institution of a School of Pharmacy—the development of scientific acquirements, and the exhibition of existing talent, will tend to confirm the confidence of the public, and remove our apparent deficiency as Pharmacopolists, when compared with other nations.

To Assistants it will afford the means of practical improvement, and an opportunity of obtaining honorary distinction.

To Apprentices the Society offers an immediate recognition of their admission to the trade, and holds out a sufficient inducement for industrious and studious habits, by affording the prospect of participation in the elevated position and character which will bereafter appertain to those who practise Pharmacy.

The course of education proposed, embraces only such subjects as should be known by every person presuming to dispense prescriptions; and though at the outset it would not be stringently enforced, it will be the duty of the Council to extend the examination as circumstances may require.

By the regulations under the head of Education and Examination, all existing Chemists and Druggists have the opportunity of escaping any restriction or ordeal which may he imposed upon their successors; and in order to enjoy this exemption, nothing is demanded from them but that they shall unite in supporting an institution which the protection of their interests has rendered necessary.

The establishment of an examination in the Classics, for all future Apprentices, will ensure the possession of that preliminary education which is essentially necessary for the creditable performance of their duties, and their ultimate success as Pharmacetists; and the increased importance and respectability which will be conferred upon Pharmacy by means of the Society, will induce many of the more wealthy classes to devote themselves to its pursuit.

In order to establish among the Chemists and Druggists of the empire a substantial and permanent bond of union, and also to

supply a deficiency which has hitherto existed, your Committee recommend the foundation of a fund for the relief of the distressed, the widow, and the orphan: and, taking encouragement from the example and success of other bodies, they trust that this collateral object of the Society will obtain universal support.

The Committee have the satisfaction of stating that a communication has been received from Paris, intimating a desire, on the part of some of the leading Members of the Society of Pharmacy in that city, to establish a scientific correspondence with "The Pharmaceutical Society of Great Britain;" and overtures of a similar character have been made on behalf of the College of Pharmacy in Philadelphia. The Chemists and Druggists of Scotland and Ireland have also expressed considerable interest in the undertaking.

Your Committee, therefore, congratulate you on the circumstance, that, although the Chemists and Druggists of Great Britain united in the first instance merely for the purpose of self-defence, in support of their acknowledged rights, that union has resulted in the creation of a National Institution for the advancement of Pharmacy, which will be enabled to carry on a correspondence with similar institutions throughout the world.

The establishment of such correspondence —the formation of this Institution—and the successful result of the opposition to the bill of Mr. Hawes, will ever be regarded by your Committee as a gratifying recompence for their past exertions.

Joseph Gifford, Chairman.

At a General Meeting of the Members of "The Pharmaceutical Society of Great Britain," held at the Crown and Anchor Tavern, Strand, on Tuesday, the 1st of June, inst., R. H. Pigeon, Esq., in the Chair, the Report of the Committee having been read, it was

Moved by Mr. Savory, seconded by Mr. Morison, and

Resolved unanimously — That the Report now read be adopted and printed for circulation.

The Laws of "The Pharmaceutical Society" having been submitted to the Meeting, it was

Moved by William Allen, F.R.S., seconded by John Bell, and

Resolved unanimously — That the Laws now read be passed under their separate heads.

Moved by Mr. Keating, seconded by Mr. Dinneford, and

Resolved unanimously — That the Laws now read and passed be adopted as the Laws of "The Pharmaceutical Society of Great Britain."

Moved by Mr. Hulse, seconded by Mr. Yarde, and

Resolved unanimously — That the several Members of the Committee be the first Council of the Society, and do continue in office, exercising all the functions and duties provided by the Laws of the Institution, until the General Meeting in May, 1842; from which period the Council shall consist of twenty-one members only, to be elected according to the Laws.

Moved by Mr. Smith, seconded by Mr. Butler, and

Resolved unanimously—that Messrs. Hallows, Redwood, Yarde, F. J. Bell, and Edwards be appointed Auditors.

Moved by Mr. Hallows, seconded by Mr. Edwards, and

Resolved unanimously — That the thanks of this Meeting be given to the Metropolitan Committee, for their earnest and successful exertions in support of the privileges of Chemists and Druggists, and especially for having laid the foundation of a National Institution for the elevation and advancement of Pharmacy.

Moved by Mr. Thomas Herring, seconded by Mr. Wilkinson, and

Resolved unanimously — That the thanks of this Meeting be given to Richard Hotham Pigeon, Esq., for his efficient performance of the duties of Chairman.

R. A. Farmar, G. W. Smith, } Secretaries.

MEDICAL REFORM.

Could we, for an instant, give credit to those who are exerting all their energies, and exciting such universal clamor for an alteration of the laws relating to medical practice, that they are actuated by motives directed solely to the advancement of medical science in its proper and legitimate form, or to the suppression of the disgraceful and disgusting knavery and chicanery which every where pervades its practical exercise, we should join them heart and hand in the laudable work of removing such a mass of moral corruption as at present exists, and should set about the task with a pleasure exceeding even that experienced by themselves in their efforts to enlarge the sources of gain by the usurpation of all the benefits of the profession to themselves.

That such beneficent and liberal motives

are far from the real causes of their operations, must be evident to every observer: in the first place, because classical education and scientific knowledge are not the sources from which their motives arise; and in the next place, because the men who compose the clique, are physicians and surgeons little known, and apothecaries for the most part passed by and degenerated; in fact, having little business of their own, they have ample leisure to twaddle in Exeter Hall, under the high sounding title of the British Medical Association—"vox et præterea nihil!!"

These men, we find, are not satisfied with braying at their various meetings, but are using other devices to mix up medical science with pot-house politics and electioneering blackguardism and falsehood. We have seen, among many other tricks, little labels of the size of an inch, having the following inscription:—"Whoever is a friend to mankind, should vote for medical reform." So, indeed, should we say, if it meant that every general practitioner, *i. e.* every apothecary, is to be compelled to receive a good classical education, and afterwards to acquire an equally competent knowledge of all branches of medical science, in which the examinations are neither partial nor extemporaneous, but minute and regulated. Such a course as this would have the two-fold advantage of warning the public against ignorance, and of conferring on this rank of the medical profession those qualities which belong exclusively to gentlemen.

We are glad indeed that the period of our publication accords with that of the general election, because it affords us the opportunity of meeting the medical reform gentry at this juncture, and we are in no fear of the result; for, that some great change will take place, is too evident to be mistaken by any but the wilfully blind or naturally stupid, and we are anxious to remind our readers that those members who are desirous of giving the lower rank of the profession an absolute power over the Chemist and Druggist, deserve no vote from them, but require narrowly to be watched during the ensuing contest. We trust that at the election, chemists will be duly impressed with, and act upon this suggestion in giving their votes and exerting their influence. Now is their time, and if they neglect it, they will next session perhaps have occasion to regret the oversight.

The ruin of the trade of the chemist and druggist, which is the legitimate object of the apothecary, will be the sure consequence of the measures sought to be made to pass into a law by the orators of Exeter Hall.

The perpetual vituperation of scribblers in *The Lancet*, about ignorant and prescribing druggists, is idle and ridiculous. What do these people think of the much more frequent errors of their order? In a recent visit to Bristol, we were made acquainted, upon unquestionable authority, of the death of a child, from sheer ignorance. What, indeed, are the host of men practising surgery without a diploma? Are these any more than prescribing chemists? Do they mean to contend that the bugbear of an examination at Apothecaries' Hall, is an adequate protection to the public, especially when into the account is taken the qualification of the EXAMINERS themselves?

We have been asked to define the office of an apothecary, but as yet we confess we are quite at a loss as to what is the peculiar province of his calling. However, from his dealing in commodities as well as aspiring to professional rank, and from those commodities being moreover of a very heterogeneous character, we should say that he is the "general dealer" in medicine, and no doubt it is the unpalatable idea that such is the case which renders him anxious to change his name by some legislative act which may give him the power of trading in fees instead of pills, pickles and toothbrushes: and should he even cease to trade in these articles, and receive payment "for work and labor done and performed," as the law terms it, unless he is far more enlightened in all respects than is now the case, he will pass only from the "general dealer" to "the pettifogging jobber" in medicine, and will be as frequently forcing his visits upon his luckless victims, as he now does his nostrums.

We hold in contempt all reflections cast upon the chemists by such men. Let any person read the account of one of them, and then let him judge if it is possible to find an equal among chemists. A medical man put a chimney-sweeper into prison * for two pounds two shillings and sixpence, although the apothecary owed him as much for sweeping his

* See the *Times* of Tuesday the 22d ult.

chimnies,—rather a long score for sweeping an apothecary's chimney!—(for apprentices inform us that great economy is practised in fire and candles),—yet to prison this man is sent, and there in a day or two he dies,* to the great *credit* of this practitioner's humanity and the *honor* of the profession! Can any one believe that a man with the education of a gentleman, and the acquirements of science, will thus disgrace himself and his brethren? The reply is—No. Such men are ignoramuses in the one, and mere smatterers in the other. We shall, indeed, be eager to get any measure calculated to reform such practices as this. Much better for the poor is it that chemists should do their best for them for a few pence paid at once, than that they should become liable to extravagant charges, and be compelled to discharge the debt by death in a prison!!

Chemists are now destined to become an educated and qualified body, and as such great good will result to the community, as the poor will be kept from debt, and from their worst alternative—dispensaries.

We hope that some provision will be made by the members of the PHARMACEUTICAL SOCIETY for the study and recreation of pupils and assistants. Many applications have lately been made to us on the subjects of "late hours" and "Sunday trading." No doubt these are detrimental to the improvement and comfort of the student, who, for study, health, and moral duties ought to have a fair allowance of leisure. We entertain no fear that these considerations will be duly appreciated by the trade generally, and that, ere long, some arrangement consistent with the mutual good of employers, assistants, and apprentices will be devised.

We cannot terminate these brief remarks without repeating our urgent desire that all diligence and caution will be employed to secure these rights hitherto so ably defended. Some active measures are indeed necessary, and these alone can save the trade from ruin and degradation. We trust, therefore, that the good fight will not cease until conquest is insured, and that those who are seeking to outstrip its members in tactics and devices, will be made to see that the "RACE is not always to the SWIFT, nor the BATTLE to the STRONG!"

* Why did not the "doctor" try to sell the sweep's body to pay the debt? We should be glad to see him change places with his late patient and prisoner, with the addition of the tread-mill.

MEDICAL REFORM AS AFFECTS DRUGGISTS.

LETTER IV.

To the Editors of The Chemist.

GENTLEMEN:—

WE have at length a real outline of a new and highly important national Institution for the advancement of science. Great credit is due to the exertions of the Chemists and Druggists, and most especially to the committee, for their labours thus far. The Chemists certainly have "achieved great things," as the worshipful grocers and barbers have also, in times past, had greatness "thrust upon them." Without any material pressure arising from medical opposition, arrogance, annoyance, or abuse, without remonstrance from the public, either, or shew of dissatisfaction with respect to their present condition, (albeit very much the reverse, as has been well testified by the public press,) the Chemists and Druggists have organized, by voluntary impulse, an Institution and system of education which, viewed as to the motive and manner of its formation, is perhaps without a precedent in the history of medicine.

That hybrid production—monstrous and anomalous—which has sprung from the ingrafting of medicine on the sugar tub, and chirurgical science on the barber's pole, styled in softer parlance the medical profession of England and Wales, has been rendered chiefly, if not entirely, what it is by the power of the legislature, urged on by the force of public opinion. Prior to any such interference on the part of the "collective wisdom of the nation," the ignorance of the medical profession was so gross, dark, and dangerous, as to be the horror and amazement of all historiographers who have written on the subject, and it is now perhaps the most exhaustless theme wherewith a medical journalist may fill up his columns. Dilating upon this same subject, a contemporary writer† says, "they, (the general practitioners) were a race of men who had received no regular education, either preliminary or professional; who had passed no examinations; whose entire complexion, as irregulars and quacks, was equally dis-

† *Medical Times*, vol. iv. p. 118.

graceful to the profession and the country; men, in fact, whom physic and surgery had robbed from gentlemen's service and regiments of infantry, as men-servants and privates of foot." "These," the same writer adds, "were lords and masters of some of the infirmaries, nearly all the dispensaries, and parish-doctors' appointments in the kingdom." That power and privilege, then, which was *forced* upon the inferior grades of the medical profession for the safety of the public, the Chemists and Druggists would be glad to accept the protection of themselves.

Might it now be irrelevant to ask how far the members of the profession have improved those powers, privileges, honours, &c., vested in them by act of parliament, for the benefit of the public? To what extent they have become more refined through the teaching of "ingenious arts;" and also whether they bear out that professional stamp, which the senate required they should be impressed with on receiving the benefits aforesaid?

In the first place, although it is the *boast* of the medical profession, that they are endowed with superior education and with high scientific acquirements, it is not in *that* profession that we need look for those generous and refined sentiments, that peculiarity of moral principle and action that marks sagacious talent or the polished mind.

> ...."Ingenuas didicisse *fideliter* artes
> *Emollit mores*, nec sinit esse feros."

But how many do we meet with who emulate the vilest quacks and nostrum-mongers in scandalizing the reputation of their brethren by the process of puffing up their own most senseless and worthless selves? Are not men to be found with diplomas to practise medicine, and thereby bound by the most solemn oaths not to countenance quackery, daily perpetrating perjury, not only in actually selling quack medicine, but also in advertising, puffing, and vending similar abominations of their own manufacture? Do they not in multitudes keep open shops and ape the man-milliner in ticketing up trashy merchandise for the purpose of catching flats and gapers? Is it not to yield the crab in place of the apple, when they dwindle to the old stock on which they were first graffed, by selling oils and perfumed grease for the peruke, soaps for "easy shaving," and the inimitable Macassar?

Without adverting in any uncharitable spirit to the various hidden and unknown instances in which human beings are untimely sent to the other world through ignorance, blunder, or neglect, do the profession observe that exterior courtesy and propriety, nay, oftentimes decency, of behaviour which alone can raise them above the multitudinous herd of petty traders, and command the reverence or confidence of the public? This, be it remembered, can never be accomplished by act of parliament—not even a "Medical Reform" Act. It is by the appearance that the world form their judgment; and when they observe that Druggists keep shops, and that Surgeons do likewise, the one perhaps clean and the other dirty, they simply enough identify the two, and even deduce from the extent of outward tidiness the degree of order that prevails within. How frightful is it to contemplate the dissolute and random slovenliness with which the weapons of life and death are often handled by medical pupils in the absence of their masters. "Throw a pint of *saline* into that bottle," was the expression of a heardless stripling one day to his fellow pupil, where I happened to be. The request was literally complied with, and the stuff *was* "thrown" in with a vengeance. It is no unusual sight to see pieces of pill mass thrown from one to another, and occasionally a regular volley of galenicals, which would bring on a general engagement. A beautiful confusion ensues!

From what has been remarked above, there will not appear on due reflection to be that occasion for arrogant boasting of itself on the part of the profession, still less for the vituperative disdain and contumely which is weekly attempted to be poured out by them upon the Chemists and Druggists. The latter have not possessed the advantages nor the legal privileges in their business which has been enjoyed by the former; but they are doing what they can to deserve the confidence of the public by *improving themselves* in scientific and other education. Would that the profession would "do likewise," and by reforming in themselves what they conceive to be amiss in others, not only spare the valuable time of the legislature, but enable the labourers at Exeter Hall to attend to their woe-begone practices and deserted homes.

I remain, Gentlemen,
Your obedient Servant,
W. G.

LATE HOURS AND SUNDAY TRADING.

To the Editors of the Chemist.

GENTLEMEN:—

THE subject of abridging the time allotted to business by Chemists and Druggists, in order to afford their apprentices an opportunity for study, has of late frequently been brought before you, and I think that, in consequence

of the excellent system of education now adopted by the Pharmaceutical Society of Great Britain, this subject demands the most serious attention of the masters, as it will become the duty of each, not only to give his apprentices every opportunity for study, but to see that they are actually qualifying themselves for the situation they are hereafter to occupy in society, by a close attention to those branches of scientific knowledge, which, it is intended, should be well understood by every dispenser of medicine. The various heads of examination, chemistry, medical botany, &c. &c. will require a vast deal of close study and practical experiment, which cannot possibly be applied to them, by an apprentice who is confined behind the counter, from six or seven in the morning to ten and frequently eleven o'clock at night, or even in the partial cessation from business, afforded by some masters, after eight o'clock in the evening, when the student is liable to continual interruption, until the shop is closed.

Some serious obstacles however exist, to closing the shops at eight o'clock, which has frequently been proposed; not the least of which is the general want of unity on the subject, among the masters; some would have no objection to it provided the others would agree; others think that nine o'clock would be quite soon enough, and on a late occasion, one gentleman, who has generally had the reputation of being a sensible man, actually objected to the scheme altogether, on the ground that the masters would not be sure where or how the young men would spend the time thus allowed them! — as though the culpable want of discipline, which thus appears to exist in his own establishment, were as prevalent in those of other chemists! In consequence therefore of the obstinacy of this individual, the whole scheme was compelled to be abandoned.

There are, however, other ways of accomplishing the object, than by closing the shops earlier: one that was proposed in *The Chemist* a month or two since, appears to me to be less liable to objections, than any I have yet seen; it was simply to allow each of the young men, in their turns, the whole of one evening for reading, while the others attend to the shop; this would allow sufficient time for necessary study, and at the same time, afford an opportunity (with the approbation of the masters,) for reading of a less important nature, as history, biography, and other subjects connected with general science and literature, not only as a necessary occasional relaxation from study, but for the general improvement of the mind. A Chemist and Druggist will be expected to know not only that which is immediately connected with his own profession, but to be well acquainted with many other branches of science and art; he ought to have a large stock, not merely of phrases and technicalities, but of general information, and he should be well able to converse on almost any subject.

A similar plan is also proposed with regard to the practical part of the course of study required. Chemistry cannot be studied properly, without experiments, and it is well known that very few experiments can be satisfactorily performed by candle or gas-light, which renders it almost impossible to judge correctly of the colour of a solution or precipitate, especially if of a blue, green, or yellowish hue, as, for instance, the precipitates formed in testing for arsenic with the nitrate or ammonio-nitrate of silver, or the ammonio-sulphate of copper; it is therefore proposed that each apprentice be allowed in turn two hours of daylight in the week, for experimenting, which would give him a better opportunity for verifying by actual observation the facts of which he has read, and for rendering himself familiar with the appearances and changes produced on bodies by chemical action.

There is also another subject on which I would wish to make a few observations; I allude to the importance of out-door exercise in the preservation of the health of shopkeepers, especially of the younger apprentices; this may be accomplished on the same principle by allowing two hours once or twice a week for one or two of the young men, to take a walk in the country, enforcing strict punctuality in this as in other relaxations from business, as the only means of avoiding abuses.

An advantage in these proposals is, that any chemist may try them, without having to obtain the consent and co-operation of his neighbours in the trade, or danger of injuring either his own business or that of any one else, and I am sure that no master who properly considers the importance of the subject, would grudge the time thus occupied, and that if generally adopted, it would tend greatly not only to the improvement and comfort of the young men, but to that elevation of the character of the Chemist and Druggist which is the object of the Pharmaceutical Society of Great Britain.

I remain, Gentlemen,
Your obedient Servant,
J. H. C.

Northampton, June 12, 1841.

LATE HOURS AND SUNDAY TRADING.

To the Editors of The Chemist.

Gentlemen:—

Seeing the deep interest you take in every thing which concerns the comfort as well as

advantage of the Chemist and Druggist, and particularly in the question of "late hours," &c., I am induced to trouble you with a description of an arrangement adopted hy a retail house in a husy part of the metropolis, the prosperous and happy working of which seems to show very forcihly how much may be done to mitigate the evil of our oppressive confinement,hy considerate management on the part of principals.

There are two assistants and one apprentice. At 7 o'clock the shop is open, and a quarter past 7 in winter. We breakfast at 8, and then each in turn has three-quarters of an hour to dress; at 2, dinner; at 5, tea; supper at 9; and shop closed hy 11, though regular employment ceases at 8. At meals each takes a week in turn to remain in the shop while the others are absent, and every morning one is allowed to walk from 7 o'clock or earlier until breakfast, and after tea every day each in rotation is at liberty to read in a sort of counting-house, where "the Governor's" scientific lihrary is kindly open to him, or occasionally, with permission, a walk is suhstituted, hut never to he absent after 9 o'clock except hy special agreement. On Sunday, no more is done than the public really require.

I am fortunate enough to helong to this establishment, and can well appreciate the advantages we enjoy over many others, having fagged for seven years to the full endurance of human nature;—for weeks together I have not heen off my legs for half an hour during the entire 13 hours out of hed, meals included, and as we had no leisure, reading, far less study, could never be thought of. Fortunately in my school-days I obtained some knowledge of science, or else, after paying a large premium and serving a long apprenticeship, I should have been turned loose as an efficient memher of an intellectual, or (might we not properly term it) *Professional Business*, as ignorant of more than its mechanical duties as the merest drudge.

A Retail Assistant.

May 24th, 1841.

To the Editors of The Chemist.

Gentlemen:—

Now that there appears to be an anxious and increasing desire amongst the greater numher of Chemists and Druggists to put an end to the practice of "Sunday trading," allow me to suggest such a plan which, in my opinion, would go far towards the removal of this serious evil—at all events it would prove how far this trading is really necessary. It is simply this, that all medicines had on that day should he charged five or six times the usual price. This is a plan which I know, from experience, to he practicahle on a small scale, and I feel convinced that its efficacy would he greatly increased by its general adoption. Leaving this at your disposal,

I am, Gentlemen,

Your ohedient Servant,

J. S.

Brook-street, June 9th, 1841.

INFLUENCE OF SEDENTARY LIFE AND PROFESSIONS, AND STILL AIR SATURATED WITH MOISTURE, IN THE PRODUCTION OF CHRONIC DISEASES, AND ESPECIALLY TUBERCULAR PHTHISIS. HYGIENIC MEANS OF PREVENTING THE DEVELOPEMENT OF THESE AFFECTIONS.*

BY M. FOURCAULT.

In this memoir are explained the results which I ohtained, hy means of ohservation and comparison of statistics, relative to the effects which are exerted on the physical constitution of man by two general causes, which appear to me to predominate over all others. By drawing from this douhle source, we ohtain a proof that, on one part, sedentary life and habits, and on the other, still air saturated with moisture, produce a great numher of chronic diseases, among which may he classed phthisis pulmonalis, scrofula, rachitis, and deformities of stature. Phthisis pulmonalis is seen to he increased in large cities, on account of the number of sedentary occupations: in an equally numerous population, its frequency is as evidently diminished among the inhabitants of rural districts, and among artisans who work in more or less spacious hahitations, and who exercise their muscular power.

From statistical investigations whose results have been puhlished, it appears that phthisis pulmonalis carries off one-fifth of the population of Paris, and one-fourth of that of London. This evidently is exaggerated. But even hy reducing it to one-tenth for the former town, and to one-eighth or one-ninth for the latter, there still would be found a remarkahle difference hetween this proportion and that which statistics give for less populous localities. Thus in cities of 2000 inhabitants and under, phthisis pulmonalis amounts to scarcely one-for-

* *Comptes Rendus de l'Académie des Sciences*, No. 92. May 31, 1841.

tieth or one-fiftieth of the total deaths, when those cities are in dry and elevated situations. In villages having this favourable position, this affection destroys only the sixtieth, the eightieth, and even the hundredth of the working population by which they are inhabited.

But when these cities and villages are situated in deep, strait, woody valleys, where the air is still, and at its maximum of dampness, phthisis and scrofula present their maximum of frequency. Their frequency diminishes towards the top of mountains, on the sandy platforms exposed to all winds. Valleys which are not very deep, where the air circulates freely, and where the moisture in the air is not considerable, produce only a small number of chronic affections; and, as in all places where atmospheric currents are powerfully felt, acute diseases predominate. However, some of the latter appear to me to be the result of the action of still and damp air on the skin; typhoid fevers, having an adynamic character, are frequent in Paris, London, and Rouën, in certain valleys, and on the damp banks of many rivers: they appear most frequently in autumn, that is to say, in the places and the season which tend to reduce transpiration to its minimum.

I confirmed the accuracy of the preceding observations in a journey which I made towards the end of the year 1840, into Belgium and England. In all places, sedentary habits and pursuits produce similar results. Lace-makers, spinners, knitters, sempstresses, and persons who are confined in workshops, die of tubercular phthisis in great numbers: this affection causes one-half of the deaths in the central houses of detention of Vilvorde and Ghent. By taking account of certain debilitating causes which operate in the state of seclusion, it is evident that man and animals die in great number from the tubercular affection, when they are confined, the former in prisons, and the latter in stables and menageries.

The influence of low and damp places developes in England and Belgium, as in France, a number of chronic diseases; the frequency of these diseases diminishes considerably towards the coast, where I have observed, especially in Belgium, the rarity of tubercular phthisis, scrofula, and schirrous and cancerous affections. It is to the influence of atmospheric currents that these happy results, and some of the physiological and therapeutical effects in persons sent to the sea-side must be attributed.

These facts show that the two general causes which I have noticed act deeply on the constitution of man, and determine a number of diseases attributed to other causes. I have induced diseases and death in animals, by suspending mechanically, by means of various stuccoes (*enduite*), the respiratory and secretory functions of the skin. Experiments, therefore, have confirmed the results of observation.

By pursuing this study, and relying at once, I repeat, on observation and experiment, light will necessarily be thrown on various questions of pathology and therapeutics. Already the facts which I have mentioned and the theory which shows their relations, explains the beneficial influence of muscular exercise, gymnastics, horsemanship, navigation, coursing, and dancing in young girls too long confined in-doors, and in subjects inclined to phthisis, scrofula, and deformity of stature; finally, these observations also show the plan that must be followed to prevent the development of a number of serious diseases, and to combat them.

OBSERVATIONS AND EXPERIMENTAL INVESTIGATIONS CONCERNING PLATINUM, CONSIDERED AS A PHYSIOLOGICAL AND THERAPEUTICAL AGENT.

BY DR. F. HÆFER.

The author first details the chemical properties of platinum and of the principal compounds of which it is the base.

In the second part of his memoir, he gives the results of experiments made on rabbits, on dogs, and on himself, with the view of ascertaining the physiological action of perchloride of platinum or chloro-platinic acid, chloro-platinate of sodium or double chloride of platinum and sodium, chloro-platinate of potassium, and chloro-platinate of ammonium.

Fiually, in his third and last chapter, he details his investigations concerning the therapeutic action of platinum.

1st. The chlorides of platinum are poisonous: the perchloride in the dose of 1 gram., the chloro-platinate of sodium in the dose of 2 grammes.

2. The chloride of platinum are less poisonous than chloride of gold and corrosive sublimate.

3. The perchloride of platinum in concentrate solution produces on the skin violent itching, followed by a slight eruption in the part to which it is applied: taken internally, it at first irritates the mucous membrane of the stomach, occasions head-ache, re-acts on the nervous system, and thus exerts a peculiar alterative action on the fluids of the economy.

4. Chloro-platinate of sodium does not produce local irritation of the skin. Taken internally, it does not act on the nervous

system so much as the per-chloride of platinum; it more especially increases the urinary secretion.

5. Per-chloride of platinum is a very efficacious remedy in the treatment of syphilitic diseases, and particularly those which are of long standing, and which are inveterate and constitutional.

6. Chloro-platinate of sodium is more adapted for the treatment of recent syphilitic disorders; it is also very efficacious in the treatment of rheumatic affections.

7. Platinum must he classed among alterative medicines, with gold, iodine, and arsenic. It differs from mercury, inasmuch as it acts after previous excitation, and as its administration is not followed by any of the symptoms which are so objectionable in mercury. The salts of gold, which appear to be poisonous in much smaller doses than those of platinum, are efficacious, according to authors, only in certain cases of constitutional syphilis.

8. As an alterative medicine, platinum is preferable to either mercury or gold.

Dr. Hæfer employs platinum in the following forms and doses:—

DRAUGHT.

Per-chloride of platinum* .	10 centig.
Mucilage	180 gram.

F.S.L. A draught to be taken by teaspoonfuls in the 24 hours.

OINTMENT.

Lard	30 gram.
Per-chloride of platinum .	1 gram.
Extract of helladonna . .	2 grams.

For rubbing on indolent ulcers.

PILLS.

Per-chloride of platinum .	5 decig.
Extract of guiacum . . .	4 grams.
Powdered liquorice . . .	q.s.

F.S.L. 20 pills, to he administered in the dose of 1, 2, 3, and even 4, morning and evening.

DRAUGHT OF CHLORO-PLATINATE OF SODIUM.

Per-chloride of platinum .	3 decig.
Chloride of sodium, quite free from salts of potassa	5 decig.
Mucilage	200 gram.

To be taken in teaspoonfuls in the 24 hours.

INJECTION OF CHLORO-PLATINATE OF SODIUM.

Crystallised chloro-platinate of sodium†	2 grams.
Decoction of poppy-heads .	250 grams.

The conclusions to which Dr. Hæfer has been led by his investigations, appear to us important, and give us reason to hope that physicians will find in the preparation of platinum, a new and powerful means of combating syphilitic affections. We should remark, however, that these conclusions are founded on but a few experiments, and that they require caution before being definitively adopted. Dr. Hæfer is also of this opinion, and, therefore, he is continuing his investigations.

Annals of the London Homœopathic Dispensary, Ely Place, Holborn. Physician, Dr. Curie. Nos. I. to XI. London: T. Hurst, 5, St Paul's Churchyard.

Homœopathy explained, and Objections answered. London: T. Hurst, St. Paul's Churchyard, pp. 16.

In our brief notice of these two works it is not our intention to enter deeply into the merits of Homœopathy; we shall decidedly avoid doing so, recommending our readers to procure the works and examine the subject themselves.

The *Annals* will he found to contain facts worthy of notice as regards the homœopathic views concerning diseases and their treatment, and will amply repay both homœopathists and allopathists for the trouble of perusal: the one, by adding to his conviction of the soundness of his favourite doctrine; the other, by giving him opportunities of refuting what he believes to he erroneous

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* Bi-chloride or per-chloride of platinum is made by dissolving platinum in nitro-muriatic acid, and evaporating to dryness. The operation must he performed at a gentle heat, for otherwise the per-chloride is decomposed, and only proto-chloride, or even reduced platinum is obtained.

Bi-chloride of mercury in concentrated solution, or in the solid state, is of a very deep red; it is very deliquescent, very soluble in water, and soluble also in alcohol. It is formed of—

Platinum, 1 atom .	1233·2	58·22
Chlorine, 4 atoms .	885·2	41·78
	2118·4	100·00

† Chloro-platinate of sodium is soluble in water and alcohol; it crystallizes in beautiful transparent prisms of a deep yellow color. It contains—

1 at. of chloride of sodium	733·54	20·8
1 at. of hi-chloride of platinum . .	2118·40	60·0
12 at. of water . .	675·00	19·0
	3526·94	99·8

It is prepared by dissolving in water per-chloride of platinum, and very pure chloride of sodium, in suitable proportions, evaporating and crystallizing the solution.

dogmas. To each of these, therefore, we recommend the works before us.

In the *Annals* will be found numerous cases successfully treated on homœopathical principles. They also contain clinical lectures by Dr. Curie.

The second work, a small pamphlet, is of a less pretending nature: it is merely a familiar exposition of the science, replying to some of the common objections raised against it. With what success the author, who describes himself as "A Non-Medical Homœopath," has performed his task, we will leave to our readers to judge for themselves.

ON THE PREPARATION OF WHITE PRECIPITATE.*

BY M. REGNARD.

I do not think that there is any means given of obtaining from nitrate of mercury, by the solution of chloride of sodium, all the precipitate, one part of which passes to the state of soluble deuto-chloride.

I have found the following method quite successful:—

I evaporated, adding to it a fresh portion of mercury, a part of the liquid containing all the soluble deuto-chloride of mercury, which was thus brought to the state of protochloride and protonitrate; I then precipitated it, as before, by the solution of chloride of sodium, and I obtained a fresh quantity of white precipitate. Thus, by the solution of mercury in nitric acid, precipitation by the solution of chloride of sodium, the addition of a small quantity of mercury to the liquid, the solution of this mercury in the concentrated liquid, and by a new addition of a solution of chloride of sodium, there is a further precipitation of white precipitate.

OIL OF COLOCYNTH AS A SUBSTITUTE FOR CROTON OIL.†

BY DR. M. G. JUNELLI.

Dr. Junelli, in the *Memoriale della Medicina Contemporaneo*, says that the oil of colocynth may be advantageously used as an external application in cases of rheumatism and neuralgy, and especially in sciatic neuralgy, as a substitute for croton oil. He says that this medicine being cheaper than croton oil, is within the reach of all patients.

* *Journal de Chimie Medicale*, March, 1841.
† Idem, ib.

BOUBEE'S GOUT SYRUP.‡

M. BOUCHARDAT'S FORMULA.

Extract of Guiacum ... }
Tincture of Sarsaparilla } āā 10 grammes.
Jalap Root ..... }

Add, with care, 100 grammes of alcohol at 21°.

Then pour in sugar syrup, 1000 grammes.

Mix carefully, and evaporate the alcohol at a gentle heat, continually stirring it.

This syrup is administered in the dose of a teaspoonful in a glass of water, and one, two, three and four teaspoonfuls until the purgative effect is produced.

M. Bouchardat thinks that physicians who have a natural repugnance to secret remedies, may prescribe the syrup whose formula is here given.

TO CORRESPONDENTS.

An Assistant.—The Laws and Regulations of the Pharmaceutical Society, published in our present No., will afford the required information. We agree with the suggestion of our correspondent, that the members of the Society would do well to engage as assistants none but such as are members of the Society.

A Chemical Student.—1,650 is right.

A New Subscriber.—Brande's Manual: that work will also give him the information respecting the battery.

An answer to J. T. M.'s question would involve too many suppositions and useless speculations, and occupy more space than the limits of our work will afford, and would then be quite unsatisfactory.

A. B. C.—The *Tinctura Lobeliæ Inflatæ* is made with ℥ii of the dried herb and Oij proof spirit.

A Subscriber, Newcastle.—What information respecting iodide of arsenic does our correspondent require? If he will let us know by another letter he shall have an answer in our next.

Carstairs' Black Writing Ink.—We received a bottle of this ink from Mr. Burton. It certainly is of very excellent quality.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

‡ *Journal de Chimie Medicale*, May, 1841.

LONDON: PRINTED BY STEWART AND MURRAY, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

INVESTIGATIONS CONCERNING THE TRUE CONSTITUTION OF ATMOSPHERIC AIR.*

BY MM. DUMAS AND BOUSSINGAULT.

Besides carbonic acid, carburetted gases, and accidental vapours, the air contains oxygen and nitrogen in apparently uniform proportions.

It is generally admitted that the air is a mixture of oxygen and nitrogen, and its invariability is explained by supposing that plants decompose by their green parts, under the solar influence, all the carbonic acid developed by the respiration of animals or the putrefaction of organic matters. The uniformity of the composition of the air would therefore furnish the measure and proof of one of the most beautiful natural harmonies, and that which, connecting the two organized kingdoms to each other by the intermedium of the atmosphere, would thus place them in a state of mutual dependence.

However, all chemists are not convinced that the composition of the air is uniform, nor even that it is a mixture of oxygen and nitrogen.

With some of them,—Prout, Döbereiner, Faulkner, and Thomson, for example,—the uniformity of the elements of the air is so certain a fact, that they regard the air as a chemical compound, formed of 20 vol. oxygen and 80 vol. nitrogen. The confidence of the learned professor of Glasgow in this respect is so great, that he has derived from this the densities of oxygen and nitrogen, which have evidently served as a basis for a system of atomic chemistry.

With others, and here we must first mention the illustrious founder of the atomic theory, the venerable Dr. Dalton, the air is looked upon as a variable mixture of oxygen and nitrogen, containing a larger proportion of oxygen in the regions which we inhabit, and less in the higher regions. In this respect, Dr. Dalton's convictions are powerful and profound; they have all the character of mathematical convictions.

Indeed, this opinion is founded less on experiment than on calculation; and the latter, presented under a rather different form by M. Babinet, has led to analagous results. According to these views, the air of Paris being formed of 21 of oxygen and 79 of nitrogen in volume, we should have the following compositions at different heights:—

	Oxygen per 100 of air.
0	21
2000 metres	20·46
6000 ,, ...	19·42
10000 ,, ...	18·42

The calculations of Dr. Dalton and M. Babinet are now at variance with the results of experiments, and particularly with the results of analyses made by M. Gay Lussac on the air collected in his memorable aerostatic ascension, with those which one of us (M. Boussingault) performed in America at considerable heights, and finally with the analyses made by Professor Brunner, on the summit of Faulhorn, during a long stay which he made there for that purpose.

Thus, some chemists, according to their experiments, look upon the air as being formed of 20 oxygen and 80 nitrogen, and as constituting a true chemical compound. Others consider that it is an uniform mixture of 21 oxygen and 79 nitrogen. Finally, some are of opinion that its composition varies with the height.

All these opinions do not give a very high idea of the confidence inspired by the method habitually employed for analyzing the air; they prove that each thinks that he perceives in it sufficient causes of error to justify the few cases of known analyses with which he is acquainted.

The uncertainty increases when it is known, that the analysis of the air most perfectly agrees with the densities of oxygen and nitrogen, given by Berzelius and Dulong, which

* Read before the Academy of Sciences, Paris, June 7, 1841: *Comptes Rendus*, No. 23.

densities are evidently incorrect, as will be seen farther on.

Thus, it was not only on account of historical instruction to be bequeathed to posterity, that it was important to submit the composition of the air to a new and very accurate study, in order to inspire men of science with confidence. With respect to one of the last wishes that Laplace expressed on this subject, and which he entrusted to the execution of the Academy, a truly irresistible influence exists; for the most delicate theories of science seem to be met in this question, to clash with, and contradict one another.

Thus, according to Drs. Prout and Thomson, all gases have densities expressed by entire multiples of the density of hydrogen. Nitrogen is 14, and oxygen 16, times as heavy as hydrogen. Finally, nitrogen and oxygen are found in the composition of the air, in exactly the proportion of 1 to 4 in volumes.

As the same doubt prevails concerning these three points, it was necessary for us to make use of processes which were totally independent of the ciphers hitherto admitted for the density of oxygen and that of nitrogen; we were also obliged to avoid basing our analyses of the air on the composition attributed to any compound which we could produce with it, for we then should have been compelled to rely on former analytical data, and without throwing any doubt on any scientific facts, we thought it best to render ourselves independent of all circumstances foreign to the precise point which we wished to determine.

We found all these conditions combined in the employment of a very simple and easy process, and in which the only novelty is the means of substituting the measure of gases by their weight. Thus, we succeeded in analysing the air by weighing its oxygen and nitrogen.

Having exhausted a phial of its air, we connected it with a tube full of metallic copper, reduced by hydrogen, fitted with stop cocks, which allowed of a vacuum being formed in it. This tube was also accurately weighed.

The copper being heated to redness, one of the stop-cocks is opened to admit the air, which rushes into the tube, where it instantly yields its oxygen to the metal. In a few minutes, the second stop-cock, that joining the exhausted phial, is opened, and the nitrogen gas passes into the phial. The stop-cocks being left open, the air flows in, and as it does so, yields its oxygen to the copper; the gas in the phial, is, therefore, pure nitrogen. When it is full, or very nearly so, all the stop-cocks are turned. The phial and the tube full of nitrogen, are afterwards weighed; they are again weighed after being exhausted. The difference of these weights gives that of the nitrogen. The weight of the oxygen is furnished by the excess of weight which the tube that contains the copper acquires during the experiment.

We do not here insist on the precautions which we considered necessary in weighing the flask when full of nitrogen and when empty; they will be more in place in the discussion of the means which we adopted for ascertaining the densities of the oxygen and nitrogen. But we must state on what our conviction relative to the very basis of the process is founded: it is the total absorption of the oxygen of the air, which passes into the tube, by means of the copper. It is sufficient to see how the experiment acts, to be fully convinced on this subject. The air is suddenly deprived of oxygen, on its entry into the tube. The copper which is oxidised occupies a limited space; after the longest experiments, the oxidation is confined to the space of two or three centimetres. At the end of the experiment, therefore, the tube contains metallic copper possessed of all its lustre, and perfectly capable of detecting the last traces of oxygen.

Nevertheless, we did not content ourselves with these appearances. Everything being arranged in the ordinary way, we tripled the velocity of the current of air into the apparatus; and in this unfavourable condition we tried whether it would retain the oxygen: it did not keep a trace of it. We directed the nitrogen through a tube containing an ammoniacal solution of proto-chloride of copper, and we could not detect any appearance of coloration in that liquid. The slightest trace of oxygen would have turned it of a deep blue.

Executed by aid of this process on a large scale, all our experiments, without exception, tended to confirm the composition of the air admitted by the French chemists, and founded on the beautiful eudiometrical experiments by which, thirty-five years ago, Baron Humboldt and M. Gay Lussac fixed the composition of the air in an irreproachable manner, as well as their instruments would permit.

We will not describe all our analyses; we here give the detail of only those which were made when we had acquired experience in the management of the process. In proportion as we diminished the causes of error which had escaped us at first, the apparent differences in the composition of the air were effaced: it appeared to be more uniform, and we were necessarily led to attribute to errors of observation, differences which, at first, seemed to appertain to the constitution of the air itself.

The air which we submitted to analyses was obtained by glass tubes in the garden of the laboratory of one of us, (M. Dumas), near the *Jardin des Plantes*. When we made two simultaneous analyses, the two tubes terminated at the same point, and consequently took the air from the same place.

Six simultaneous experiments, two and two, therefore, give the following results:—

		PER CENT. OF AIR BY WEIGHT. Small phial.	Larger phial.
April 27.	Oxygen	22·92	22·92
28.	,,	23·03	23·09
29.	,,	23·03	23·04
	Mean	22·993	23·016

And by taking the mean of the six experiments we find—

Oxygen	23·010 or 23
Nitrogen	76·990 or 77
	100·000 or 100

for the composition of the air in the circumstances under which we operated.

In an experiment in which we operated on air taken in the laboratory, we found only 22·5 of oxygen per cent. of air by weight. This difference, which is scarcely appreciable by the ordinary endiometrical methods, is expressed in our process by ciphers so considerable, that it could not escape the least attentive observation; but we reserve for another time the investigations relative to vitiated air which we intend to perform in a physiological and a hygienic point of view.

Thus, confining ourselves to the composition of normal air, we find that in the last days of April and in fine weather, it was formed of 2300 of oxygen, and 7700 of nitrogen by weight. This fact being independent of every correction and of every coefficient, may serve for discussing some ciphers of very great importance, namely, the densities of nitrogen and oxygen. Indeed by taking

2300 oxygen,
7700 nitrogen,

10000 air,

and dividing each of these numbers by the respective densities of oxygen, nitrogen, and air, we must find a suitable correspondence in the volumes deduced from them. And as the density of the air is unity, 10000 of air by weight represent 10000 in volume, which should form the sum of the volumes of 2300 oxygen, and 7700 nitrogen. We should therefore have

$$\frac{2300}{1{\cdot}1026} + \frac{7700}{0{\cdot}976} = 10000,$$

if the densities of oxygen and nitrogen given by Berzelius were correct. But, on the contrary, we have

	By weight.	In volume.
1st,	10000 air	= 10000 air
2d,	7700 nitrogen	= 7889 nitrogen
	2300 oxygen	= 2086 oxygen
		9975 air in vol.

The volume of air, which ought to be equal to 10000, would therefore amount to only 9975, corresponding to an error of $\frac{25}{10000}$. As we thought that such an error was not possible in our experiments, we thought it necessary again to take the densities of the oxygen and nitrogen, with redoubled care.

The principle on which we had relied gradually led us into many obscurities; but we hope that there will result from it a method capable of introducing into this kind of investigations a precision with no other limits than those that result from the capacity of the vessels.

The density of a gas may be appreciated by comparing the weight of air which a phial loses when exhausted *in vacuo*, and that of the gas which is passed into it. This method is very convenient; it is most frequently employed, but it supposes that the gas is previously collected in a reservoir from which the phial is filled. Now, we wished to avoid preparing our gases beforehand, and preserving them in receivers, a practice attended with many difficulties, relative to the purity of the gas, on account of the changes of gas and air, which are effected by contact with the liquid saturated with air, which is confined to certain limits difficult to exceed.

The following is the process which we followed:—The gas was prepared so as to come pure and dry to the extremity of a tube put in communication with an exhausted phial. On opening the stop-cock of this vessel, the gas rushes into it. Its production and introduction into the phial are so regulated that there is always in the apparatus which serves to produce and purify it, a more than ordinary pressure.

When the phial is full of gas, it is exhausted and filled again. It is then supposed to be full of pure gas.

The weighing must then be proceeded with as follows:—1st, the weighing of the phial full of gas; 2nd, that of the exhausted phial; 3d, that of the phial full of dry air. They may be proceeded with in the order indicated, and they furnish the weight of the gas, and that of an equal volume of air.*

It remains to ascertain the proper temperature of the gas and that of the air in which the phial was weighed. It is in this, without doubt, that consists the secret of the differences observed in the numbers expressing the densities of the gases given by so many illustrious philosophers and chemists, and so different from one another, that no one ever dared to take their mean.

In order to have certain uniform and easily appreciated temperatures, we were obliged to place in the phial M. Danger's thermometer, which indicates the hundredth of a degree. The stem of this thermometer is fixed in a glass tube interposed between the socket of the phial and its stop-cock. The observer may then read off the exact temperature of the gas,

* This principle has already been turned to account in the investigations relative to the density of carbonic acid gas, by MM. Dumas and Stass. (See *The Chemist*, No. XV. p. 65.)

without moving the phial from its circle, where it is in a state of equilibrium of temperature.

This circle or artificial cave is formed by means of a large cylindrical zinc vessel, surrounded by a larger one, with a space of two centimetres between them. The annular space left between them, the space between the internal and the external vessel, is filled with water. The opening of the cave is covered with a moveable lid, in the thickness of which is a layer of water two decimetres thick.

The phial lodged in this circle is consequently surrounded by two decimetres of water, whose temperature is known to the $\frac{1}{100}$ of a degree. The phial being likewise furnished with a thermometer which indicates its internal temperature with the same precision, it is sufficient to wait until the two thermometers correspond, to be certain that the gas possesses the same temperature throughout, to nearly $\frac{1}{100}$ of a degree.

There is no occasion to push the accuracy further in this respect, because in the largest of our phials an error of $\frac{1}{100}$ corresponds only with an error in the weight of $\frac{7}{10}$ of a milligramme—a weight which a balance charged with one or two kilogrammes does not appreciate.

When the stop-cock of the phial is shut, the pressure of the gas is known to the twentieth of a millimetre, since it is equal to that of the external air, expressed by the barometer, and its temperature is known to the $\frac{1}{100}$ of a degree.

To ascertain the exact weight of the phial, precautions of the same order are necessary.

Indeed, when the phial is suspended to the balance, and when the observer approaches to weigh it, he heats the phial and the air surrounding it: currents are established; the apparent weight of the phial varies to such an extent as to preclude all idea of absolute accuracy.

We made use of a balance on Fortin's system, very carefully constructed by M. Deleuil, balance-maker to the French Mint. This balance was placed in a double leaden sideboard, with a layer of quicklime inside, to maintain the air in a constant hygrometric state. The phial, suspended by the balance, floats in this sideboard, and the doors of the latter being shut, it is sheltered from all external radiations. A thermometer, giving the hundredths of a degree, placed by the phial, immediately gives the temperature of the air of the sideboard; a barometer gives the pressure.

In general, we cannot obtain the weight of a phial twice alike; and in general, the air of the sideboard undergoes variations of a few hundredths of a degree, and correction being made, the weights coincide. If the observer could not take account of the temperature of the air with the extreme precision that we have done, he would be led to take a mean between the apparently discordant weights, and his mean would be inaccurate; while in reality the weights were very accurate, and required only a correction of temperature, to perfectly agree with one another.

By means of these processes, we first took the weight of oxygen a great number of times, which showed us most evidently that the density, 1·1026, given by MM. Berzelius and Dulong, could not be retained, and was farther than any from the truth, as, however, M. Dulong feared.

The experiments which we performed on the latter, and in which we adopted every measure calculated to ensure complete success, were made with oxygen prepared with a mixture of concentrated sulphuric acid and peroxide of manganese. The gas was purified by passing through tubes or flasks containing *liquor potassæ*, and it was dried by being driven through tubes or flasks containing pure concentrate sulphuric acid.

DENSITY OF OXYGEN.

1st experiment	1·1055
2d do	1·1058
3d do.	1·1057
	3·3170
Mean	1·1057

This exactly corresponds with the density adopted by M. T. de Saussure—1·1056. It nearly coincides also with the old density of MM. Biot and Arago—1·1036; and the deficiency of the latter is no doubt owing to the oxygen, so carefully prepared by M. Thenard for the experiments of MM. Biot and Arago, having acquired a small quantity of atmospheric air, in passing through the water used to electriate it.

The correction which we have just made in the density of oxygen, far from establishing a correspondence between the composition of the air which we determined by accurate experiments, and the densities of oxygen and nitrogen, increases the difference between them, which we have shown above. Indeed, we should have—

$$\frac{2{\cdot}300}{1{\cdot}1057} = 20{\cdot}80 \text{ vol. oxygen.}$$

$$\frac{7{\cdot}700}{0{\cdot}976} = 78{\cdot}89 \text{ vol. nitrogen.}$$

99·69 vol. air, instead of 100·00.

That is to say, that with our composition of the air, our density of oxygen and the density of nitrogen of MM. Berzelius and Dulong, the density of the air cannot be represented. The error is very great; for in an element of this importance, an error amounting to nearly half per cent. is enormous.

This is owing to MM. Berzelius and Dulong's having admitted a composition of the air nearly like ours, being led to compensate for the too low density of oxygen which they found, by too high a density for nitrogen.

We took the density of nitrogen by means

of the nitrogen procured from the air by copper, absorbing the carbonic acid and water, with potassa and sulphuric acid. The following are the results of three experiments:—

DENSITY OF NITROGEN.

1st experiment	0·970
2d do.	0·972
3d do.	0·974
	2·916
Mean	972

By adopting this density, that of oxygen, and the proportion in weight by which we have represented the composition of the air, we find the following numbers:—

$$\frac{2{\cdot}300}{1{\cdot}1057} = 20{\cdot}80 \text{ vol. oxygen},$$

$$\frac{7{\cdot}700}{972} = 79{\cdot}22 \text{ vol. nitrogen},$$

100·02 vol air,

which represents to nearly $\frac{1}{10000}$, the density of the air taken as unity. By taking the numbers as given by experiments—

$$\frac{2{\cdot}301}{1{\cdot}1057} = 20{\cdot}81 \text{ vol. oxygen},$$

$$\frac{7{\cdot}699}{{\cdot}972} = 79{\cdot}19 \text{ vol. nitrogen},$$

100·00 vol. air,

we should have a similarity.

However, we will admit, as sufficiently accurate, the expression of the composition of the air, which consists in considering it as formed of 20·8 vol. oxygen and 79·2 vol. nitrogen.

This expression is evidently very much at variance with the commonly received opinion; still, very serious corrections were required to be made in the densities of the nitrogen and oxygen, in order to ascertain the ponderal composition of the air.

By considering for a moment, as normal air, that which we collected towards the end of April, in fine dry weather, in the neighbourhood of the *Jardin des Plantes*, we might now, therefore, regard its composition as perfectly established to less than $\frac{1}{1000}$ in volume or weight at will.

But this composition should vary. When it rains, the water which condenses dissolves and carries away more oxygen than nitrogen; when it freezes, the water abandons these gases; evaporating water also returns them to the atmosphere. Combustions, the respiration of animals, remove oxygen from the air; plants, by their green parts, return it to it every day, under the solar influence. These causes, and many others without doubt, tend to disturb the equilibrium of the elements of the atmosphere in a given point, some in one direction, some in another. It therefore remained to be ascertained whether the tendency which gases have to mix, aided by the vertical currents which the difference of temperature excites, favoured by the winds which incessantly transport and confound the horizontal layers of air, would not rapidly cause the disappearance of the momentaneous differences resulting from the local action of the causes which we have just briefly mentioned.

Experiments made with this view, to be positive, would require time that we could not devote to it, and apparatus which we do not yet possess. In making our trials, we therefore especially kept in view to seek the limit, below which it would be useless to undertake such.

All the experiments above detailed, having been made in fine and dry weather, we repeated them on a wet day; the oxygen being carried away in solution by the water, in a larger proportion than the nitrogen, this circumstance promised more appreciable differences than any we could imagine. Unfortunately, we could realize our expectation only with a little variation from our first analyses. The following are our results:—

Weight of the oxygen		5g. 648	23·015
Weight of the nitrogen	of the tube . . 0.052	18·892	76·985
	of the phial . . 18.840		
Air analysed		24·540	100·000

Thus, while the mean of our six experiments made in fine weather, gave 23·010 of oxygen per 100·000 of air, we found in rainy weather, 23·015, or exactly the same proportion. It might be supposed, indeed, that the difference of the season compensated for that produced by the rain; but these variations are too slight to be put in evidence, except by a numerous series of experiments, carefully executed in a laboratory devoted to meteorological studies. It was demonstrated to us that the oxygen does not vary $\frac{1}{1000}$ under the influence of rain; a result which may be explained, if it be wished, by saying, that before coming within four metres of the earth—the height at which we took the air for analysis—the rainwater was already saturated with air in the higher regions of the atmosphere which it had passed through. But in this case the analysis could teach us nothing, except by throwing to a considerable height a phial destined to bring into the layer of air, whence the rain is precipitated, the tube which yields to the apparatus the air intended for analysis.

Does the quantity of oxygen vary with the height? Nothing shows this to be the case, and we are warranted by positive experiments in believing the contrary.

The air brought by M. Gay Lussac, from a height of above 7000 metres, was analysed by

him and M. Thenard. It was not then known, as it is now, with what facility hydrogen is impregnated with air, on the contact of water. The analysis indicated a little too much oxygen, 21·6, every correction made. But as the precaution was taken, of analysing at the same time, in the same manner, and with the same hydrogen, air taken in the court of the *Palais Bourbon*, it was shown, by the identity of the results, that air taken at the surface of the earth, and air taken at an altitude of 7000 metres, had the same composition.

The numerous experiments executed in America, by one of us (M. Boussingault, see *The Chemist*, No. XVII., page 129,) are represented in mean by the following numbers:—

	Metres.	Oxygen per cent. in volumes.
At Santa Fé de Bogota at	2650	20·65
At Ibaqué ..... at	1323	20 70
At Mariquita ..... at	548	20·77
Mean		20·70

	Metres.	Oxygen per cent. in volumes.		
Mountain of Helvellyn.....	900	20·70	Manchester	20·88
Id.		20·58	*Id.*	21·10
On Snowdon.....	1050	20·65	*Id.*	20·80
Air taken in a phial at	2880	20·52	*Id.*	20·92
Id., taken at	4500	20·59	*Id.*	20·95
Air taken at the sea of ice valley of Chamounix		20·20		
Air of Simplon		19·98		
Wengern Alp		20·45		
Id.		20·11		

By studying these numbers, it is seen that among Dr. Dalton's analyses, those which he made on recently obtained air are found comprised within the limits of the possible errors of the hydrogen eudiometer; those which were executed with air brought from the Alps, on the contrary, are very far from it. Must these differences be attributed to an accidental alteration of the air, or to an actual modification in the composition of the atmosphere of the two places? It is this that we very much desired to set at rest.

For this purpose, it was necessary to compare the air analysed near the surface of the earth, and by means analogous to ours, with that which we had ourselves analysed. We therefore profited by the excellent observations of Professor Brunner, of Berne, on this subject. This skilful chemist went to spend a few weeks at the top of the Faulhorn, one of the mountains of Bernese Oberland, in a house situated at a height of 1950 metres, and there he devoted himself to the analysis of the air. As the Faulhorn and the Wengern Alp form part of the same chain of mountains, Brunner's experiments may serve as a means of comparison with the analyses made by Dalton of air taken in the latter locality.

At first sight, Professor Brunner's analyses and ours appeared incomparable. Indeed, he removed the oxygen by means of phosphorus, and he appreciated this oxygen by the weight. But as in each of his experiments the weight of the oxygen scarcely exceeded 120 or 130 milligrammes, the error which he might commit must amount to at least $\frac{1}{100}$, and even to $\frac{1}{80}$.

As for the nitrogen, Professor B. measured it, and deduced its weight from its density.

Thus practised, evidently on too small a scale, this method would indicate variations in the oxygen from 20·8 to 21·1 in volumes per cent. of air. But, this difference can be owing only to errors of weight, for it does not exceed $\frac{1}{70}$, and is nearly within the presumable errors of experiment itself. Besides, the extreme numbers are identical with those which eudiometrial analysis gives at Berne or at Paris.

These results evidently agree with those which we have just found for the composition of the air taken at Paris: they indicate at least that the differences, if there be any, are not of the order of those indicated by the theory, the calculations, and even the experiments of Dalton.

Dr. Dalton published a series of various and numerous experiments, from which it would appear that the proportion of the oxygen to the nitrogen is not the same in all localities at the surface of the earth; that it varies with the seasons and the height. His analyses would show that in proportion as we ascend in the atmosphere, the oxygen very considerably diminishes, although not so much as his theory indicates. The following are the principal results to which he attained:—

But as it was difficult to avail ourselves of Brunner's experiments, they therefore became more valuable when we considered them as a whole. Indeed, by combining them to make an unique experiment, the errors of weight ought to be compensated; and if, as we think, the composition of the air varies little from one day to another, it scarcely matters whether this experiment lasted a fortnight, or whether it was made at once.

Professor Brunner, in his fourteen experiments, collected 4502 cubic centimetres of nitrogen at 0° and 0′ 76, i. e. in weight 5 gr.

7649. The sum of the fourteen determinations of oxygen gave 1 gr. 723 for the total weight of that gas.

Thus, at the top of the Faulhorn, *during the month of July*, 1833, the air contained the following elements :—

Oxygen ..	1·7230	23·010
Nitrogen ..	5·7649	76·990
	7·4879	100·000

whilst we found 23·010 as the mean of our analyses; Professor Brunner therefore found 23·010 as the mean of his. Take, however, 23·010, or rather 23·015, which would result from our best analyses, it is clear that differences of this nature are owing to errors of observation, or are confounded with them.

It is not very probable that during the time occupied by Brunner's experiments, there was any variation in the air of the Faulhorn, although his partial experiments indicate slight ones, which we attribute to errors of weight. It is therefore demonstrated that the composition of the air at the top of this mountain, was precisely the same as that which we find in Paris at the present time, our assertion being bounded by the limits that observation can attain to, namely to nearly $\frac{1}{1000}$; for we do not wish to go farther, although it may be done.

M. Brunner's process has lately received an application in a very interesting locality, on account of the distance which separates it from Paris and Berne; that is, Groningen. The author, M. B. Verver, has accidentally omitted to mention the year in which he made the experiments, but we have every reason to believe that they were made in 1839; they were executed, moreover, in the months of May and August.

They lead to precisely the same consequence; for, according to M. Verver's experiments, the air of Groningen contained, in weight, 22·998 of oxygen or 23, as we found in Paris, and M. Brunner on the summit of the Faulhorn.

Thus, without pretending that Dr. Dalton's opinions concerning the constitution of the atmosphere are ill founded; it is shown that by the effect of the diffusion of the gases, by the various causes of agitation which incessantly tend to mix the layers of air, the difference which might otherwise exist at various heights, becomes inappreciable.

If the composition does not vary with the altitude, if no appreciable difference can be discovered when it is analysed at points situated at some distance from each other, is it the same when the proportion of the gases which constitute it are compared at different times?

This very interesting question has already excited the attention of MM. Laplace and Thenard. These illustrious men of science desired that an analysis of air, executed at certain periods in an official manner, should allow the true constitution of the atmosphere to be fixed for a given period, and that its modifications, if it presented any, should be noted.

If the academy has not hitherto fulfilled this desire, it is because the analytical processes were totally inefficient for this purpose. We shall soon show that if the process which we have just employed was not suitably modified, it would not present any chance of discovering the variation which the composition of the air is susceptible of, through causes which actually act on the surface of the globe, and whose effect cannot reach the limits in which the old analyses of the air are confined, or even those which we have just performed.

It is not, therefore, in the old analyses of the air that we can find terms of comparison fit for verifying the doubts relative to the permanence of the constitution of the atmosphere.

But it appeared to us that the weight of a litre of air, so carefully taken by MM. Biot and Arago, offered an excellent term of comparison. If this weight is not the same now as then, it is doubtless the composition of the air that is changed; but if this weight has not varied, it must be concluded that this weight is the same as it was forty years ago. As the weight of the litre of air was determined to about $\frac{1}{1000}$, the precision of which this comparison admits, exceeds that which can be obtained by any other process.

We have endeavoured to render this comparison as certain as possible, by taking a phial nearly of the same capacity as that used by MM. Biot and Arago; by weighing at the same temperature as they did; finally, by weighing the phial in the air, without a thermometer inside, that is to say, absolutely the same as was done before we applied to these kinds of experiments the precautions which we have described.

Four experiments, made in this way by one of us, in conjunction with M. Stass, last year, would give 1 2995 for the weight of the litre of air, while MM. Biot and Arago found 1·2991.

These numbers are similar; but to obtain the weight of the air more accurately, it evidently was necessary to introduce into this mode of weighing the precautions of which we availed ourselves in taking the density of oxygen and nitrogen. We are now engaged with it. In the meantime, we may deduce :—1st, from this comparison of the weight of the litre of dry air at 0° and 0m 76 ;—2d, from the justly celebrated analysis of MM. Gay Lussac and Humboldt, compared with ours,—that the composition of the air has not varied to an appreciable extent for forty years. This conclusion will not surprise meteorologists, whom long custom has taught to look on atmospherical phenomena as less easy to be modified by accidental causes than is commonly admitted.

It is therefore demonstrated that the proportion of oxygen to nitrogen in the air, is not expressed by simple numbers in volume; that this proportion is invariable to $\frac{1}{1000}$ in distant latitudes, at distant periods, and at different heights.

The phenomena of organic life, the spontaneous decompositions of animals and plants, the combustions or oxidations which are accomplished on the surface of the earth—all these events, which our imagination is pleased to enlarge upon, are, happily, without doubt, those facts which pass, as it were, unnoticed as regards the general composition of the air which surrounds us. To reach the limit at which may be perceived the variations which the atmosphere might undergo, from the animals or plants, from the seasons, rains, and winds; to decide whether its composition remains invariable in various latitudes and at various heights, it is not necessary, therefore, to perform the analysis of the air to $\frac{1}{50}$, as formerly, nor even to $\frac{1}{1000}$, as we have done; it is necessary to go farther; as if, by a providential foresight, nature had intended that the possible alterations of the atmosphere by the regular play of the forces which act at the surface of the earth should never approach, even at a distance, to the limit at which animal or vegetable life might suffer from it.

Some calculations, which, doubtless, are not absolutely accurate, but which, nevertheless, are based on sufficiently certain data, show to what extent it is possible to push the approximation so as to reach the limit where the variation of oxygen could be evidently manifested.

The atmosphere is incessantly agitated; the currents excited by heat, by the winds, by electrical phenomena, perpetually mix and confound its various layers. Therefore the general mass should be altered in order for analyses to indicate variations between one period and another.

Let us suppose, with B. Prevost, that every man consumes a kilogramme of oxygen per diem, there are one thousand millions of human beings on the surface of the earth, and that by the effect of the respiration of animals or by the putrefaction of organic matters, this consumption attributed to man be quadrupled.

Suppose, moreover, that the oxygen disengaged by plants compensates only for the effect of the causes of absorption, forgotten in our estimate: this will put very high, certainly, the chances of alteration of the air.

Indeed, by this exaggerated hypothesis, at the expiration of a century, all the human race combined, and three times as much, would have only absorbed a quantity of oxygen equal to 15 or 16 cubes of copper of one kilometre the side, while the air contains nearly 134,000.

Thus to pretend, that by using all their efforts, the animals which inhabit this globe could in a century deteriorate the air which they respire, to the extent of one eight-thousandth part of the oxygen which nature has furnished to it, is to make a supposition infinitely higher than reality.

The respiration of animals produces carbonic acid; plants destroy it, seizing the carbon, and restoring the oxygen to the air. The modifications which the air undergoes with respect to its oxygen will, therefore, be almost of the same order as those which are observed with respect to its carbonic acid.

Now it is easy accurately to estimate the weight of the carbonic acid contained in the air, by means of M. Thenard's method, which consists in weighing in the state of carbonate, the carbonic acid yielded by a large volume of air carefully measured. This method, modified in its details by MM. de Saussure and Brunner, indicates that the carbonic acid of the atmosphere varies in volume from $\frac{4 \text{ to } 6}{10,000}$. Supposing that this carbonic acid comes from the oxygen yielded by the air, and not from that incessantly emitted by volumes, the difference of these numbers, which is equal to $\frac{2}{10000}$ of the volume of the air, would express the variation which the oxygen should have undergone.

Thus, in 10,000 volumes of air would be found 2081 or else 2083 of oxygen.

This difference would evidently be inappreciable, if we limited ourselves to analysing 10 or even 25 grammes of air, as we have done, since it would be represented by one or two milligrammes. In operating on 100 grammes of air, the difference would be equal to 20 or 30 milligrammes. In analysing 1000 grammes, it would amount to 200 or 300.

It is necessary to arrive at that, if it be wished that the analysis of the air should really become of some utility in the discussion of the general laws of terrestrial physics.

But as we have no means of weighing one cubic metre of nitrogen, it evidently is necessary to change the process which we have just described for one analogous to M. Brunner's, by which the nitrogen is measured, and only the oxygen weighed.

An apparatus of one cubic metre, full of water, must be placed in a cellar, and the nitrogen of the air which has lost its oxygen, by passing through a series of tubes filled with copper and heated to redness, must be passed into it. Three tubes, each containing one kilogramme of copper, would be sufficient for one cubic metre of nitrogen. By weighing these three tubes, they will make known the oxygen of the air with an accuracy worthy of the present state of science; for we shall have fixed 376,000 milligrammes of oxygen: and in executing ten experiments, we shall be able to determine the oxygen to nearly $\frac{1}{300000}$ with certainty.

The delicate point of these experiments con-

sists in measuring the nitrogen at an exact temperature.

To say that we desire that this experiment should be made at Paris, under the auspices of the Academy, would be merely to repeat the wish long since expressed by Laplace and Thenard—a wish in which all the friends of science concur.

But we may now go farther: France is enriched with new centres of scientific activity; faculties full of life and ardour are disseminated over the surface of its soil. The Council of Public Instruction would, we have no doubt, enter into the views of the Academy, and ordain, in concert with it, a simultaneous experiment which would allow of the analysis on the same day, by operating on about $1\frac{1}{2}$ kilogrammes of the air at Bordeaux, Strasburg, Rennes, Lyons, Toulouse, Montpellier, &c.

Moreover, without quitting the circle of our personal friends, and without the Academy's assistance, we are certain that as soon as an experiment of this kind could be established in Paris, and as soon as all the minor arrangements of the apparatus could be determined, we could obtain the concurrence of chemists and philosophers, who would execute at Geneva, Naples, London, Dublin, Brussels, Stockholm, Copenhagen, &c., experiments simultaneous with those made at Paris.

It is for the Academy to decide whether these investigations are worthy of the interest with which they have inspired some of its most illustrious members, and whether, combined with the experiment in which M. Arago is engaged with his double tube, they do not hold out a promise of data concerning the composition of the air sufficiently important to justify our desire of seeing them soon executed under its patronage.

For our part, our task is fulfilled; what we could do with our individual means, we have accomplished.

Our investigations correct errors in the density of oxygen and that of nitrogen, and fix the former at 1·1057, and the latter at 0·972.

They shew that the air can by no means be considered as a chemical compound formed of 20 volumes of oxygen and 80 of nitrogen.

They make it to be presumed that the air is an uniform mixture at every time, in every latitude, and at every height, of 2301 of oxygen in weight, and 7699 of nitrogen; or indeed 20·81 of oxygen, in volume, and 79·19 of nitrogen.

They shew that if atmospheric air constitutes a reservoir of oxygen for the use of animals, and a reservoir of carbonic acid for the use of plants, this magazine is so considerable, and so richly endowed with regard to consumption, that the latter, supposing that it was not compensated, would remain almost insensible in the mass, even after a long series of years:

Whence it follows that there is no chance of appreciating real differences by the analysis of the air, as to the proportion of oxygen and nitrogen, if we do not make suitable arrangements for executing this analysis on about $1\frac{1}{2}$ kilogramme of air.

All the experiments detailed in this Memoir, were executed with the zealous and conscientious concurrence of two young chemists, to whom we are indebted for their assistance, M. Leblanc, formerly pupil of the Paris School of Mines, and M. Lévy, a Danish chemist, who are going to execute, at Copenhagen, observations corresponding to those of Paris.

After the reading of the Memoir of MM. Dumas and Boussingault, on the motion of M. Arago, the academy decided that a commission should be appointed to discuss measures to be adopted for the realization of the new work indicated in this memoir, that is to say, analyses of the air made simultaneously in various French and other towns, with all the precautions considered necessary for ensuring perfect accuracy in the results. This commission will be composed of MM. de Humboldt, Thenard, Biot, Gay Lussac, Arago, Dumas, Boussingault, and Regnault.

ON THE ATOMIC WEIGHT OF IRON.

BY M. CAPITAINE.

If a piece of zinc be plunged into a solution of proto-chloride of iron, as neutral as possible, in a short time the zinc becomes powerfully magnetic; and if the immersion be continued long enough, a pappy mass is formed, which is iron. At the same time, bubbles of hydrogen are disengaged. By this process, it seems impossible to obtain iron free from zinc.

To obtain it, it is necessary to solder to the zinc, a sheet of well cleaned copper, which must descend into the ferruginous liquid. This sheet is gradually covered with a lamellar layer of iron, which may easily be detached by bending the copper in different directions. The iron is of a bluish white, and possesses metallic lustre, especially on the side next the copper; it is extremely friable. In order to dry it without altering it, I submitted it to a current of pure and dry hydrogen, at a dull red heat; after this operation, the metallic plates acquired a very great tenacity. Regarding the iron as perfectly pure, I wished to use it for verifying the atomic weight of iron given by the most recent authors. I adopted two processes:

1st. Proxidation by means of nitric acid, and the comparison between the weight of the

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metal employed, and that of the peroxide obtained.

2nd. The solution by means of dilute sulphuric acid in a graduated tube over mercury, and by measuring the hydrogen disengaged. (It is difficult thus to dissolve all the metal.)

These two operations, and especially the first, which appeared to me capable of great accuracy, have always given a mean atomic weight of less than 339, and which, deduced from the best operations is not far from 321. The atomic weight of zinc being greater than that of iron, we cannot attribute to its presence the difference which exists between the cypher which I obtained and that given in the most recent works.

Iron thus obtained, acts with reagents in the same manner as ordinary iron; I should observe, however, that its peroxide appeared to me rather more fusible.

I have communicated to the academy only the first part of this work, because I had observed in the reduction of the peroxide, certain peculiarities for which I have not had time to account. Such is the formation in the tube of a small quantity of a white volatile sublimate, which occurs only when the temperature is very high. The hydrogen was purified by passing through a very large flask filled with potassa and chloride of calcium.

REVIEWS.

Lectures on Chemistry, including its Applications in the Arts. By Henry M. Noad, Lecturer on Chemistry, &c. No. I.—London: Scott, Webster, and Geary, Charter-House-square; Hastings, Carey-street.

Mr. Noad, Author of "Lectures on Electricity," is now engaged in publishing, in parts, a Course of Lectures on Chemistry, a most excellent work.

The first of these lectures, being exclusively devoted to a history of chemistry, and of its most distinguished professors, from the dark and unenlightened days of alchemy to the present time, when discoveries have illumined that which before was obscure, does not enter into any details concerning the science to be treated of in future numbers. From the able and succinct way in which the author has handled his subject in the present number, we augur well for the future; and we recommend it to such of our readers as are beginners in chemistry, as being most eminently adapted for them.

To select a passage for insertion here, is a task attended with some difficulty; there is no portion of the work more excellent than the rest. The following anecdote — given also in other chemical works—may serve as an illustration of the belief in the transmutation of metals, once so prevalent:—

"In the preface to the Bibliotheca Chemica Curiosa, the following history of a transmutation, is given by Mangeters, on the authority of M. Gros, a clergyman of Geneva; with it I shall conclude this short sketch of alchemical absurdity, and pass to a notice of some of their far more philosophical contemporaries.

"About the year 1650, an unknown Italian came to Geneva, and took lodgings at the sign of the Green Cross. After remaining there a day or two, he requested De Luc, the landlord, to procure him a man acquainted with Italian, to accompany him through the town, and point out those things which deserved to be examined. De Luc was acquainted with M. Gros, at that time about twenty years of age, and a student in Geneva, and knowing his proficiency in the Italian language, requested him to accompany the stranger. To this proposition he willingly acceded, and attended the Italian everywhere for the space of a fortnight. The stranger now began to complain of want of money, which alarmed M. Gros not a little, for at that time he was very poor, and he became apprehensive, from the tenor of the stranger's conversation, that he intended to ask the loan of money from him. But instead of this, the Italian asked him if he was acquainted with any goldsmith, whose bellows and other utensils they might be permitted to use, and who would not refuse to supply them with the different articles requisite for a particular process which he wanted to perform. M. Gros named a M. Bureau, to whom the Italian immediately repaired. He readily furnished crucibles, pure tins, and quicksilver, and the other drugs required by the Italian. The goldsmith left his workshop that the Italian might be under less restraint, leaving M. Gros, with one of his own workmen as an attendant. The Italian put a quantity of tin into one crucible, and a quantity of quicksilver into another. The tin was melted in the fire, and the mercury heated. It was then poured into the melted tin, and at the same time a red powder, enclosed in wax, was projected into the amalgam. An agitation took place, and a great deal of smoke was exhaled from the crucible, but this speedily subsided, and the whole being poured out *formed six heavy ingots, having the colour of gold.* The goldsmith was called in, and requested by the Italian to make a rigid examination of the smallest of the ingots. The goldsmith, not content with the touchstone, and the application of aqua fortis, exposed the metal on the cupel with the lead, and fused it with antimony, but it sustained no loss. He found it possessed of the ductility and specific gravity of gold; and, full of admiration, he exclaimed that he had never worked before upon gold so perfectly pure. The Italian made him a present of the smallest ingot as a recompense, and then, accompanied by M. Gros, he repaired to the mint, where he received from M.

Bacuet, the mintmaster, a quantity of Spanish coin, equal in weight to the ingots which he had brought.

"To M. Gros he made a present of twenty pieces, on account of the attention that he had paid him; and after paying his bill at the inn, he added fifteen pieces more to serve to entertain M. Gros and M. Bureau for some days; and in the mean time he ordered a supper, that he might on bis return have the pleasure of supping with these two gentlemen. He went out, but never returned, leaving behind him the greatest regret and admiration. It is needless to add, that M. Gros and M. Bureau continued to enjoy themselves at the inn, till the fifteen pieces, which the stranger had left, were exhausted."

But while we are amused by tbe extravagancies of the pursuers of alchemical delusions, at those who sought for the means of converting every thing into gold—the philosopher's stone—and the means of perpetuating health and life—the *elixir vitæ;* let us not forget that to these fanatics of science we are indebted for many very valuable discoveries.

The present number affords an excellent means of comparison between alchemy and chemistry. This comparison is interesting and useful in the highest degree: it shows the progress of the science, from the dark ages of mystery, and of the monopoly of knowledge, to the enlightened days of tbe unsophisticated development of scientific truth, and of the wide diffusion of information.

We may add that this work is to be completed in twelve parts, and the author pledges himself, if the twelve parts be not sufficient for his purpose, to give a thirteenth gratuitously.

In conclusion, we may recommend the lectures to the perusal of our readers: beginners, especially, will find it an invaluable work.

Proceedings of the London Electrical Society, Session 1841-42. Edited by the Secretary, Charles V. Walker, Esq. No. I. London: Simpkin, Marshall, and Co.

These Proceedings will be hailed with delight by all lovers of electrical science, amongst whom we may reckon ourselves.

The science of electricity has recently received a fresh development from the discovery of the electrotype, and from the labours and investigations of Messrs. Spencer, Smee, De la Rive, Jacobi, Mason, Murray, Grove, Sturgeon, Daniell, &c. &c. &c.

The present Number of the "Proceedings" contains, among other highly interesting papers, the following important ones:—Mr. Pollock, on "the Nature of the Change of Colour of Bodies by Heat, and their Conducting Power;" a letter from Mr. Pine, describing "the effects of Vegetable Points on Free Electricity, and the position they thus occupy in the Economy of Vegetation"—a very clever article; and Mr. Walker, on "a Constant Acid Battery, with Observations on Electrotype Manipulation," which, for the benefit of such of our readers as devote themselves to electrotype operations, we give entire.

"At a time like the present, when the very attractive art of electrotype is insinuating itself into every circle, any information tending to simplify the process and render it familiar, cannot fail of being acceptable to the Society. As in all other arts, so in this, there is much to be derived from experimental acquaintance with the subject, which cannot by any possibility be deduced from theoretical analysis. Having had considerable practice in the art, I am induced to lay before the Society some of the conclusions to which I have arrived with respect to the nature and power of some parts of the apparatus employed.

"DIAPHRAGMS.

"First, With regard to the porous partitions, designated diaphragms, by which the two liquids of "the constant battery" are separated, none are more durable, and in all points better than those formed of plaister of Paris. Those of paper offer but little interruption to the passage of the electric current, but are not capable of entirely preventing the mixture of the two liquids, the consequence of which is, a great destruction of the zinc by *local* action. There is also with these diaphragms a great and extravagant deposit of copper within the folds of the paper; they are also very disagreeable to handle: the same, in a less degree, may be said of animal membrane. Those of wood, I have never employed, because there are many things equally serviceable, and attainable with greater facility. Among these, rank first those composed of biscuit ware, a delicate porous material, and those formed of pipe-clay. For experiments of no long duration, these are very useful; they effectually keep apart the two liquids, and readily admit the voltaic action to pass. But when these are used for any length, even a moderate length of time, their pores become filled with the metallic copper, and thus are rendered in a great measure useless. I have examined the fracture of some that have been in action for many weeks, and the structure has presented as much the appearance of a *conversion into* copper as that of petrified wood does the appearance of stone.

"Those formed of good *fresh* common plaister of Paris,—that used by builders—are less liable to these objections. I have now [May] by me a set of nine, formed from a bag of this plaister, which was new and fresh (the freshness for this purpose being an important point) some of which have been in constant use since the middle of February last. One of them I have particularly noticed: I had it on the table, in illustration of a lecture on electrotype,

delivered in the early part of March. It had then been fourteen days in action, and was free from all defect. Since that time it has been used with little respite, and is now to all appearance as fitted to endure as it was two months ago. The others are in the same good condition. I would not be suppnsed to speak of these as indestructible, for, like all things, they yield to 'Time's destructive hand,' but not till they have done ample service.

"These diaphragms may be made of any shape; those I am in the habit of using for batteries employed to copy medals of the various sizes are 6 inches high, and $3\frac{1}{2}$ by $2\frac{1}{2}$ external diameter. They are cast in a mould of sheet copper. The little resistance they offer to the passages of the voltaic current may be judged from the fact, that I am in the habit of making medals in a *series* of six or eight;* and the power will pass through the six or eight cells containing them, and produce a thick deposit in less than three days.

"BATTERIES.

"The selection of a battery depends upon circumstances over which the experimenter may have no control. If he wishes in a short time to copy a small object, such as a seal, the best and simplest form is that termed *the single cell* apparatus. It is nothing more than to pour a saturated solution of sulphate of copper containing a little sulphuric acid into an earthen jar; to place in this one of the plaister or other diaphragms, containing water rendered slightly acid, and then to insert a wire bent U shape, having the mould at one end, and a piece of zinc, either amalgamated or not, at the other; the zinc being, of course, placed within the acid, and the mould within the sulphate of copper.

"This will not be found to answer, when the object to be copied is large. The solution becomes so soon exhausted, that a change takes place in the character of the deposite. It may not be uninteresting to the members of the Society, especially as the subject was introduced before, when Mr. Mason made known his improvement in the process—it may not be uninteresting to say a few words on the causes which influence the character of the deposites; because the disclosure of these will furnish the experimentalists with a guide to direct them in their pursuits, especially should unfavourable results occur. It was thnught that the rotten deposite,—a characteristic with which all who are but just initiated into the art are familiar, resulted from the presence of the sulphate of zinc among the sulphate of copper.† That this is not the case may readily be determined by merely pouring a little of the former solution into the latter, when it will be found that, according to the admirable laws which regulate these actions, the copper will be deposited pure and firm.

This may also be determined by using a *brass* plate in a decomposition cell, when the zinc contained in the brass will remain behind in the solution, and the copper alone will be released. The real cause depends on the relation subsisting between the generating power, dependent on the action between the zinc and the acid; and the strength of the solution of sulphate of copper, on which this power is exercised. If the latter is well saturated, the copper will be released pure aud firm; if it is almost exhausted, the hydrogen gas will be released with the copper, and the deposite will be a dull *powder*. In the wide range between these two states is found the brittle depnsite; it appears under many varieties of forms according as the solution is nearer to a state of saturation or to one of exhaustion, on the one hand, or according to the energy or weakness of the affinity between the zinc and its exciting solution on the other.‡

It is not an easy matter to supply crystals in proportion to the copper released from the solution, if large objects are being copied. For these it is decidedly necessary to use an additional cell, and to select a battery in proportion to the work to be performed.

Professor Daniell's constant battery is the most generally useful, especially where a series of medals are being copied. Where only one object is to be copied, or objects contained in but one decomposition cell, Mr. Smee's battery will be fouud very useful. But so far as I have yet experimented, the action of his upon a series of medals is very far slower than that of an ordinary constant battery.

"The simplest and best form of a constant battery may be obtained by an easy application of the art itself of electrotype. It consists in coating the interior of an earthen jar with copper, released from a solution; and it is effected in the following manner:

"Take a large jelly-pot,—nne to cnntain a quart will do very well: place in it a few pieces of wax. Then, stand it by the fire till the wax is entirely melted, and the vessel has become exceedingly hot; after this, turn it about, so that the wax will adhcre to every part of the interior; pour off the remaining wax, and place aside the jar to cool. When it is quite cold, brush the wax coating with black lead, until the whole is well covered. It is requisite for this purpose to be acquainted with the nature of the black lead employed:

* Vide "Proceedings of the Electrical Society," April 7, 1840, p. 203, note. 4to.

† Ibid.

‡ "This latter condition exists in a modified form, when a *large* piece of zinc is used, with a *small* object to be copied. The deposite is very *hard*, but not tenaceous. It may be easily broken in copying seals and such like small objects; little pieces of zinc an inch square are quite large enough."

some specimens are far inferior to others: it is not unfrequently found that the common article, used for domestic purposes, is better for this, than the finer and purer sorts. When the vessel is coated well, pour in it a solution of sulphate of copper, and place within this a porous diaphragm, containing acid water. In this put the amalgamated zinc, and bend its wire, so that it shall press upon the blackened surface of the jar; after a few hours' action, the jar will be coated with copper, and will form a very efficient generating cell, to be excited in the usual way.

"Of the application of this cell a very important modification may be arranged, by converting it into an ACID *battery*, analogous to the platinized silver of Mr. Smee. Those who are acquainted with the ingenious device of that gentleman, are aware that the characteristic of his arrangement is, that the negative plate, where hydrogen is released, shall part with this hydrogen very readily. Under ordinary circumstances, the hydrogen adheres very much to the plates of an acid battery, and throws a considerable portion of the plates out of action, by its presence on their surfaces. To remedy this, he has, as he terms it, "platinized" the surfaces. This process consists in throwing down from a solution of platinum this metal, in a finely divided state, on a surface of the negative state. The effect of this is, that the immense number of exceedingly small points offer so many facilities to release the hydrogen, and prevent its adhering to the plate. This process of Mr. Smee's was followed out in the construction of a battery for electrotype purposes, from the generating cell I have just described.

"The cell, as already mentioned, will be found to contain a *brilliant* coating of metallic copper, as released from the cupreous solution; this coating presents a surface consisting of myriads of minute glittering points, and is thus in a degree analogous to Mr. Smee's battery. But the analogy may be carried out still further, for if the deposition of metal is allowed to continue until the solution is exhausted, the surface will become black instead of bright, and will consist of much more minutely divided particles. This cell may be used with amalgamated zinc, and one solution of acid water. Its action is slow but constant. The zinc remains clean till it is entirely consumed; there is no need of re-amalgamation; the mercury appears to return to the operator, and, which is most important, the work produced is of the *finest* and *firmest* description. I have experimented for very many months, but *never* produced finer or better deposites than with this battery. I have mentioned that its action is slow, and therefore when time is an object, its application is not profitable. Generally, I should estimate that it requires *twice* the time of an ordinary Daniell, but when this can be allowed, the result will repay the sacrifice. I have paid sufficient attention to the action of this arrangement to enable me safely to recommend it as the *best* form yet suggested for *coating* objects. For this purpose, it is absolutely requisite that the deposite should be so *fine* as not to disfigure the object experimented on, and so *firm* as to be secure against the ordinary accidents to which it may be subject. These batteries, like those of Mr. Smee, are not so applicable in obtaining a series of copies; for the obstruction of the interposed liquid greatly retards the action of the battery, and the operation proceeds but slowly."

"I must not omit to mention, in the description of the *constant acid battery*, that I employ the porous diaphragms, although there are not two different liquids to separate. My object in this is to keep that portion of the solution which is becoming saturated with the sulphate of zinc, apart from the other. This prevents the possibility of the zinc becoming deposited on the surface of the copper. And when that portion is saturated and removed, its place can be supplied with fresh, without disturbing the other.

"Batteries of this description are readily connected with the cells containing the objects of experiment, by means of a wire simply bent and pressed against the copper coating: a slight connection is sufficient. And here it may be useful to remark, that in electrotype manipulation, the failures in nine cases out of ten result from the power of the battery being too *strong*, and not from its being too *weak*. The brittle and rotten deposites are the results of this: the nature and relation of these have been elsewhere treated of. There are many laws connected with the production of metallic deposites which are far from having yet been established. The watchful experimenter will daily glean much instructive truth, — the thoughtful one will deduce many conclusions. Whilst speaking of this very convenient battery,—convenient whether used as a constant Daniell's or a constant ACID battery, a few words may be said on the subject of the zinc plate,—on its size. The plates I employ are when first cast, about $1\frac{1}{2}$ in. by 4 in.; as these diminish in size by use, their relation to the copper plate is altered, and the result is evidenced in the nature of the deposited copper. It is pure, but in large grains. Therefore it is requisite to have the zinc element,—in fact to have the battery cell, for the zinc constitutes the very essence of this cell,—of a reasonable size. BATTERY CELLS MUST NOT BE TOO SMALL. They may be *weakly* excited, rather than too small. The size may be estimated from the observations given in the former part of this communication."

MOULDS.

"From the latest experiments, I am led to

adopt *three* substances for obtaining moulds of moulds or other objects,—*fusible metal, wax and stearine.* The first for small medals, the second for plaister casts, the last for larger or small medals. There is much more trouble attending the use of the fusible metal; many repetitions are necessary before a perfect cast is obtained. The advantages in favor of it are, that the moulds obtained furnish medallions with a rim, adapting them for being mounted. This rim cannot be obtained in wax and stearine moulds, without much trouble. The best mode of manipulating with fusible metal is what the French term *clichées.* The metal is poured on a sheet of paper, and is stirred well together with two cards till it is about to solidify; at which moment the medal is pressed sharply into it, and held firm till the solidification occurs. The object in view in stirring is to break the crystals. The casts thus obtained are very fine.

"In using wax on plaister casts, the main secret consists in not applying it too hot, lest it should find its way into the plaister and tear the cast in the attempts to remove. I have elsewhere published the mode of *preparing* plaister casts for the reception of wax,* and shall not detain the Society with a recapitulation here. Since writing those remarks, experience, purchased by the destruction of not a few good casts, has taught me to use the wax at a temperature just high enough to keep it in a fluid state. If the wax is used to copy works in metal, it must be kept in the fire some time after it is melted, and the metal must be previously warmed. But as there is always a trouble in removing wax from metal, it is better to devote stearine to this purpose; it is not so expensive an article, and is very rarely found to adhere. To facilitate the separation between stearine, or wax and metal, the latter may be polished when practicable with common black lead, and the advantage will be readily perceived.

"With these observations I will conclude the present communication. I am still engaged with further experiments, and hope soon to furnish the Society with fresh information on this alluring and interesting science."

Mr. Walker exhibited to the Society a battery cell, and plaister diaphragm, constructed on the principles described, and explained the mode of manipulation.

In conclusion, we advise our readers to purchase this very interesting periodical: they will derive much valuable information from it.

* Vide "Electrotype Manipulation," second edit. p. 15.

MORTON'S APPARATUS FOR THE DETECTION OF ARSENIC.†

To the Editor of The Lancet.

SIR:—

At p. 585, vol. i., for the present year, you obligingly inserted a description of my method for detecting arsenic by the aid of galvanism; the principal feature of which was, that by it I had removed one of the two objections that have been raised to Mr. Marsh's mode of obtaining nascent hydrogen as a test for arsenious acid, namely, the action of dilute sulphuric acid upon zinc: the objections resting on the fact, that both this metal and sulphuric acid have occasionally been found to contain arsenic. Since then I have endeavoured, by an alteration in the apparatus, by which it is at the same time simplified,—to do away with the necessity of using sulphuric acid as well as the zinc, thus obviating both objections, and I hope I have succeeded.

The alteration consists, firstly, in having but one tube instead of two, and this is much larger. The advantages resulting are, a greater quantity of gas may be collected for examination, and the froth that forms when organic fluids are operated upon, more readily falls. Secondly, the electricity enters by means of a number of pointed wires instead of pieces of platinum foil, and thus the decomposition of the suspected fluid is more quickly effected. I need hardly say that the analyst must be careful that the *negative* electrode, or zincode, of the battery, is connected with the gas-receiver, otherwise the arseniuretted hydrogen that may be evolved will be lost. The oxygen is allowed to mingle with the fluid in the outer vessel.

I confess that I have not found any agent that liberates such minute quantities of arsenic as sulphuric acid does; therefore, when this can be obtained *absolutely pure,* I should prefer it: yet as much of this acid now met with in the shops contains arsenic, from iron pyrites being used in its formation, it is extremely desirable that some other agent should be substituted.‡ After trying a great number of substances, I find that pure potash, or its carbonate or nitrate, may be advantageously made use of instead. The advantage is, that the arsenite of potash formed is much more soluble than arsenious acid. About two drachms to a pint of the solution I have found sufficient.

The plan to be pursued in cases of suspected poisoning by arsenious acid is thus rendered sufficiently simple. It is this:—portions of the stomach that have been corroded by the acid,

† From *The Lancet.*

‡ In twenty fluid ounces of this acid examined by Mr. G. O. Rees, he found 22·58 grains of arsenic; and Mr. H. H. Watson, in the like quantity of another sample, calculated the existence of no less than 97·416 grains.

or the contents of this viscus, or parts of any other organ in which the poison accumulates, are to be boiled for half an hour in distilled water, to which some potash or its carbonate is to be added. The solution being placed in the galvano-arsenical apparatus, it is to be connected with a galvanic battery. The one I have used in my experiments is on Smee's principle, having ten pairs of plates, five inches square, and excited by diluted sulphuric acid in the proportion of one part of acid, by measure, to fourteen parts of water. A Wollaston's answers very well. The first portions of gas that are given off, being principally hydrogen mixed with the atmospheric air in the tube, may be allowed to escape. That which is subsequently disengaged is to be tested in the ordinary way. Orfila considers it sufficient that the metallic spots are dissolved in excess of nitric acid, which converts the arsenicum into arsenic acid; to this nitrate of silver being added, a brick-red precipitate is thrown down —the arseniate of silver. M. Lassaigne proposes the arseniuretted hydrogen pass through a solution of pure nitrate of silver; which becoming decomposed, the silver is precipitated in black flakes, and arsenious acid is produced, mixed with the excess of nitrate of silver. This excess of nitrate of silver is to be decomposed by hydro-chloric acid; and the chloride of silver thus formed, and the metallic silver, are to be separated by filtration. The filtered liquor being heated, the nitric acid which it contains reacts on the arsenious acid, and converts it into arsenic acid; the properties of which are to be ascertained by the usual methods. Lassaigne is of opinion that by this means one grain of arsenious acid may be detected when dissolved in eighteen gallons of water, or in the proportion of one-millionth part. It would be very easy to cause the arseniuretted hydrogen to pass up through a solution of the nitrate of silver, by removing the jet, and attaching a flexible tube to the stopcock in its place.

Trusting that the above apparatus may prove available in the hands of the medical jurist for its intended purpose, I beg to subscribe myself, most respectfully, yours,

W. J. T. Morton.

Royal Veterinary College,
May 1, 1841.

II. CHEMICAL MANUFACTURES.

MANUFACTURE OF BLACK EARTHENWARE.

To the Editors of The Chemist.

Elland, near Halifax, July 13, 1841.

Gentlemen:—

Since it has been suggested to me by several of your readers that a short account of the manufacture of black earthenware, as it is extensively carried on in this parish, would not be unsuitable for your valuable publication, I have determined to follow out the suggestion in as concise a manner as is consistent with a clear exposition of the process.

That manufactures of this nature should have been so long and so successfully pursued, may be explained by the great prevalence of aluminous deposits in the vicinity of Halifax, a clayey soil constituting, according to the best authorities, more than one-half of the cultivated land, and a considerable portion of that which is unenclosed. Bricks, too, are made in vast quantities, but since their manufacture is so simple and well-known, I shall confine my observations to that of earthenware alone.

The numerous hills, which serve to diversify the scenery of this and many other parts of Yorkshire, are the principal seats of this species of manufacture, the clay here being of a superior quality, and admirably calculated for the purpose. After first paring away all the greensward, turf, &c., from the surface, the clay is then dug up, and put into what the workmen term *pits*. These are holes about three yards square, from which clay had been previously taken. Here the clay is broken down and mixed with water until it assumes somewhat the consistence of thin paste, or "stir-about." The grosser materials are allowed to subside, and then the water, holding in suspension the finer and purer portions, is passed through wire sieves into similar pits, where it remains during the whole of summer, that the fine clay may precipitate, and that the superabundant liquid may evaporate.

The aluminous deposit is now dug up, and conveyed to the pottery, where it undergoes an operation called tempering, which consists in moving it backwards and forwards, and kneading it. From the tempering room it is taken in small quantities, and rolled on a smooth stone in the manner that bakers knead and roll their dough. After this it is weighed into portions, varying in bulk according to the vessels which are to be made. Each lump in succession is now placed on the potter's wheel or lathe, and moulded by the hand of the workman into the desired form. This lathe is an antiquated piece of machinery, and consists of a circular plate of stone, fixed horizontally on the top of a revolving upright shaft, to which motion is communicated by means of a windlass. The windlass is worked by the hand. The workman in the formation of his

wares, is of course greatly assisted by the centrifugal force which the motion of the wheel developes. The different articles thus moulded are in summer dried in the open air, but in winter, or during rainy and damp weather, on shelves arranged around and in the vicinity of the furnace. When they are sufficiently dried, which the workmen know by their appearing white, becoming light, and emitting when struck a dull sound, they are arranged within the furnace, where they are subjected to a white heat for forty-eight hours.

The furnace in shape resembles a bee-hive, around which in the inside are fixed shelves supporting the manufacture. Along that portion of the furnace adjoining the ground, the fires are placed in what the workmen term boxes. Each of these has an aperture at the top for the admission of fuel, and another looking internally, through which the heat and blaze pass to ascend up the centre of the furnace, and thus go out through a chimney at the top of the cone.

After the ware has remained the usual time, the fires are allowed to go out, and on cooling the manufacture is withdrawn through a large opening in the side of the furnace, which had been previously built up with fire-bricks. Before the pots are placed in the furnace, I ought to have mentioned that they are first stained on the inside, and in a great measure over the outside, with a liquid having suspended in it a mixture of powdered galena and peroxide of manganese. This operation is effected on the outside by means of brushes, but on the inside by whirling the vessel rapidly on the potter's wheel whilst containing a small portion of the said mixture. The heat of the furnace afterwards, by partly reducing the metals, gives to the manufacture that glazed appearance which it then possesses.

The laborers employed at these places include males and females, and notwithstanding the cold and wet to which they are so constantly exposed when handling and kneading the clay, they seem stout and healthy, and often live to a tolerably advanced age. Neither does the high temperature of the furnace, which is in action about once a-week, injure them materially.

The moulding is invariably performed by a man well skilled in the art, and the delicacy of touch which these persons evince, whilst at work, is truly astonishing.

Ware of this description is comparatively cheap, a cart-load scarcely exceeding a pound in value. Its cheapness opens for it a ready market with the lower classes, amongst whom bottles, bowls, mugs, and pitchers are in constant demand. Nor is this sort of ware confined to Yorkshire. I have observed it in almost every part of the kingdom, though in some places a preference is given to the salt ware made at Rotheram, the glazing of which instead of being black or dark olive, is generally light brown and yellow.

Potteries of this kind, arranged as they are on the loftiest hills, usually form a peculiar feature in the landscape, and during the night when the furnace is in brisk action, the ruddy flames which ascend from its dome, serve as a sort of beacon and companion to the weary traveller. Often have I experienced the value of such a light in journeying where my medical duties called me.

When the clay in the vicinity of the pottery begins to fail, the manufactory is removed to where this material is more abundant. I have witnessed several removals of this kind. The source of the wealth of many families once resident in this neighbourhood, has been the manufacture of black earthenware.

I had intended making a few observations with respect to its antiquity. This however would be taking upon myself an unnecessary task, since in all likelihood most of your readers are perfectly familiar with this interesting part of the subject.

I am, Gentlemen,
very respectfully yours,
JOHN S. HILEY, M.B.

DESCRIPTION OF AN APPARATUS FOR INCREASING THE ILLUMINATIVE POWER OF COAL GAS.

BY T. W. NAYLOR.

IT is a well-known fact, that carburetted hydrogen owes nearly all its illuminative power to the accidental admixture of a certain oily vapour which is given off during the decomposition of the coal in the retorts; being aware of this, it occurred to me that if the gas could be more strongly impregnated with a similar compound, the flame would be increased in intensity, which I afterwards found to be the case.

The apparatus consists of a brass reservoir or chamber attached to the end of the gas-pipe, near the burner. This reservior may be in the shape of an oil-flask, made air tight, with a screw joint or other means of supplying any highly volatile oil, turpentine, or mineral naphtha, and should be kept about half full. Into this reservoir the gas-pipe ascends a little above the surface of the oil; a very small jet-pipe of gas, regulated by a stop-cock, is branched off below this chamber, to supply a minute flame, so as to cause a sufficient evaporation from the oil to unite with the gas in the flask receiver. The whole is of course surmounted with the usual burner and lamp glass.

By employing this apparatus for burning coal-gas, the intensity of the flame will be very considerably augmented, consequently the same degree of light may be obtained with

a far less consumption of gas, a point which I consider of some importance. It may be also employed for burning those varieties of gas obtained by the decomposition of several of the anthracites, bituminous earths, wood, &c. which could not be otherwise employed with any advantage for the purpose of illumination. In conclusion, I may remark that the apparatus, from the simplicity of its construction, might be manufactured at a very trifling cost, possessing likewise the advantages of being very compact and neat in appearance.

III. PHARMACY, &c.

MEDICAL REFORM.

How far the late elections have terminated according to the hopes of the select few who occasionally pour forth their eloquent lucubrations in Exeter Hall against "ignorant chemists and impostors," we leave time to prove; and that, we feel convinced, will show that they have lost a great portion of their patrons. Their stratagems and devices, their threats, placards, and labels have all proved useless; their handful of votes and atom of contest have now sunk, to rise God only knows when, nor have they now any one to fly to in their troubles.

The ideas of this little band of twaddling knaves being able to obstruct, or even to influence the general feeling was too ridiculous a farce for the conception of any brains but their own. What course will they now pursue? Surely they will not venture a second time to impose their humbug on Mr. Hawes? and we are quite sure that they will find no one in the New House of Commons very ready to hazard his reputation merely to please an insignificant group of unemployed and disappointed men, who, because they have neither intellect nor knowledge sufficient to make themselves respectable, are resolved to "die game," and to put forth their last efforts to become at any rate notorious.

All coercion—all devices to frighten both candidates and voters—are for some time, at least, at an end; and therefore we hope to see professional men devoting their time and talents to the acquirement and diffusion of knowledge, rather than scrambling for the "loaves and fishes." We urge them to imitate the bonours and distinctions of the Hallers, the Campers, the Harveys, and the Hunters, and not to draw down upon themselves the odium cast upon their craft by Shakspeare, in *Romeo and Juliet*,—"The caitiff wretch, the beggarly account of empty boxes, thinly scattered to make up a show," are ugly sounds.

We would remind these reformers, that what they are seeking to obtain by foreign means is to be acquired only by those immediately within their own power, and through no other agency, namely, personal merit and distinction in knowledge. Such are the surest means of pursuing fame, and the most honourable means of seeking fortune. Were the attainment of knowledge held up as the sole source of distinction, and were close and accurate examination employed to ascertain the absolute qualifications of graduates, the differences now being contested would certainly be settled, and the profession might hope soon to take its proper rank in the scale of science and popular esteem, and its professors would stand untainted with the imputation of craft, ignorance, and cupidity: they would not only deserve, but gain, by knowledge and public respect, those advantages which they are struggling to coerce by law.

The whole system of education in the science, from beginning to end, is bad; the means of examination, worse; and the men who are entrusted with those important offices, objects of pity and contempt. Instructions and examination ought to go together in one regular course of succession, in order that not only the attainments but even the attention and the application of the pupils to the study of their profession may be known and judged of; for, according to the present method, by the time that the investigation of their knowledge is made, what they have not absolutely neglected during their instruction (and really it is difficult to say what part this is) is forgotten, so that at the end of the period of their learning, they know little or nothing,* yet are they

* Will our readers believe it possible, that through the present cruel ignorant and con-

somehow or other admitted at the Hall and College, and passed off as enlightened members of a liberal and important profession.

Would it not be a much more enlightened and liberal arrangement, and one much more conducive to the comfort and advancement of the student, to be subject to admonition and reproof for negligence and misconduct, concurrently with his pursuits of scientific knowledge, than to total rejection and lasting disgrace, at a time when he is at the close of his career of learning, and about to enter into life, when of all other times he should not only be free from stain of character, and imputations of ignorance, but should appear "with all his blushing honours thick upon him," and not be for ever blasted. That system of teaching and ascertaining the acquirement of learning by pupils is alone of worth, and entitled to respect, which corrects and reproves, and does not disgrace and destroy. Little need we say of the qualification of the great mass—(it is a mass—*rudis indigestaque moles!*)—of medical men: is there in fifty, or, indeed, in five hundred, ONE who knows scientifically any thing about medicine? Are there not ninety in every hundred who are even making fortunes, who have no legal qualifications from either College of Surgeons, or Apothecaries' Hall,—little protection as they afford?*

The College of Surgeons has no power to prosecute persons practising surgery without their diploma: hence all the proceedings at Saw-bone Hall are a mere pantomimic exhibition. One of their farces has lately been played off in the presence of several of the bishops, Sir Robert Inglis, and others of the same clique. An oration has been delivered, in language, for which, if the orator had been at a public school, instead of being at the show-room in Lincoln's Inn Fields, he would have received a certain number of stripes upon that part of his epidermis which immediately covers the glutæi. Dr. Johnson observed that, "if the birch were prohibited the boys would lose as much at one end as they gain at the other." We suppose that the punishment is considered, according to his doctrine, and that of Butler, to be most effective by being confined to that part, for there is as much reason to suppose that stripes are felt in the same ratio as kicks—

"For kicks, they say, in that part more
Hurt honour than deep wounds before;"

because it is—

—"The seat where honour 's lodged,
As wise philosophers have judged."

Let any one take the small pains to enquire into the education and qualifications of the host of low practitioners at the east end, and suburbs of London, and other crowded vicinities; he will soon discover a delectable *mélange* with which to enlighten the public, who perhaps are not aware, that it is a sort of medical jobbing, "a good hit," to set up a shop in such places, and one which will soon enable the fortunate adventurer to ride in what their wives generally call a *shay*.†

Unfortunately for the middling class, which forms the great bulk of society, these men, viz. the apothecaries—between whom and the enlightened pharmacien of France, there is a melancholy contrast—are those to whom all who cannot afford the exorbitant fees of physicians, are compelled to have re-

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temptible method of teaching and examining, out of eighty candidates lately brought up, for probation at University College, more than thirty, *i.e.* nearly one half, were rejected! Would this, we ask, have been the case, if the method we have laid down were adopted? It is too easy to see the consequences to the rejected, if any of them should fix their destination near that of their fellow and more fortunate candidate: they may be sure that the story of their being turned back will be circulated to the advantage of those who have been accepted, more through chance, we are convinced, than knowledge, but to the injury of the feelings and eternal stigma of those rejected by a set of drivellers, at whose hands a diploma is a memento of contempt and ridicule.

* The apothecaries, it seems, still have the power to prosecute unauthorised persons, and they exercise it once in twenty years, in doubtful cases, and pass by hundreds where it is required.

† In the time of Hogarth, a shop in Gin-lane must have been a fine "spec." Why not attach one to the posterior of every gin palace? We see nothing in such an arrangement more strange than that Henry the Seventh's chapel should be at the extremity of Westminster Abbey, like the tail or os coccygis of the building.

course for advice in medical cases, with the exception of such as are attended with danger, in which "further advice," as it is called, is resorted to. In cases of surgery, the poor go at once to hospitals; and all who can raise a guinea very properly refer their cases to some surgeon of known education and eminence.

Can any one who takes the pains to think on these subjects (which indeed are serious ones to all who have the desire to see justice done to the community) fail to observe the dire necessity of a total and immediate revolution of the existing state of medical education, government, and practice?—can he be so blind as not to see that in this profession, except among physicians and hospital surgeons, there exists no public mark by which to ascertain who is who,—the scientific man from the mere dolt and the illiterate mountebank? Success in business is perhaps the worst test: for ignorance is always remarkable for intrusiveness and assurance; while sense is retiring and modest.

It is argued,—Are not the examinations at the hall, and the certificate of the qualifications there given, sufficient guarantees of the acquisitions of the pupils? We reply No! They are a perfect farce —a libel on common sense, and a complete delusion to the public: their pharmacopœia is a patchwork of inaccuracy and bungling. Any sort of questions, extemporary, are proposed, and the pupils feel, when they get their authority and diploma, that their knowledge has been as little ascertained as if they had never been examined at all. We contend that a complete and thorough examination at stated periods, upon each subject separately, can alone develope the state and degree of the pupil's knowledge and application to his profession: anything short of this is worthless, because a pupil may be passed or rejected at the caprice and temper of the ignoramuses who are entrusted with the office of examiners. Were the questions laid down by a proper rule, there could be no error, no sense of injustice, nor cause of disapprobation: the stigma could no longer be felt by the candidate, and his animosity to the examiner would therefore be for ever at an end.

If the medical profession in this country were in the same respectable state as regards the knowledge of its members, as it is in France, Germany, and in Scotland,—were the individuals as much to be distinguished for their classical as for scientific knowledge, they might indeed call for some check upon any unfair encroachment upon their rights and emoluments by Chemists and Druggists: but when we know that, taking them generally into the account, by far the greater portion, namely, the lower rank, or what a contemporary calls the "working class," they will be found to present to the mind a very apt illustration of the vulgar simile of "the pot and the kettle," in which the blackness is far greater in the former, than in the latter vessel.

We cannot conclude our observations without expressing the pleasure we feel, that the step has been adopted which we so strenuously urged in our first number, and which we have continued to advocate in subsequent ones, namely, the formation by chemists and druggists, of a society for the protection of their rights, and for the instruction of their pupils in those branches of science connected with their pursuits. We cannot, nor will we, yield the priority in this advice to any one: we have received from the meetings of the trade in the provinces, the most cordial thanks for, and approbation of, our interest and zeal in the promotion of its welfare, respectability, and advancement. Our journal has been commenced solely with the view of furnishing them with the means of expressing and redressing their grievances and oppressions, and of laying before them all the improvements in chemistry, chemical manufactures and pharmacy, in this country, and on the Continent, occurring within the period of publication.

The Chemist cannot fail to be of the greatest importance to all who follow the profession of pharmacy, of whose cause and rights it has been the first and chief advocate in the hour of need and danger, against the devices of the enemy and the oppressor.

To make the pages of our work the mere vehicle of colloquial news, the organ of trivial concerns, or the medium of commercial controversy, would be utterly derogatory to the character of a scientific record, and beneath an association with the subjects of which it treats.

The interests of our readers are best consulted by the selection of subjects through which to advance them in the sciences with which they are connected; and by making integrity of character and attainment of knowledge their just title to the rewards of public confidence and protection. The steady pursuit of

such objects on their part, will gain them respect and esteem, and ensure to THE CHEMIST the continuance of that approbation it has hitherto received.

MEDICAL REFORM, AS AFFECTS DRUGGISTS.

LETTER V.

To the Editor of the Chemist.

GENTLEMEN :—

If Frenchmen and other foreigners are astonished and amused at the way in which small occurrences in the political world are here moulded into all the various and peculiar forms of *party*—are made the subjects of lengthy and sometimes furious and elaborate articles in our public prints; what must be their astonishment and amusement to find, on peeping into the medical periodicals, that the same legerdemain and wonder-working giant has a game to play even there! Accordingly in the "leading journal" of the "medical press" two or three weeks back, we are informed that the "advent of the Queen to the throne" has had a most "beneficial effect in bringing about principles"—of what does the reader imagine?—of some new and grand state policy?—some momentous revolution in the commercial and financial condition of the country?—some reform in the representative system?—nothing of the kind, The "accession of the Queen" (who is said to have a "steadfast heart that does not quail in carrying out principles," &c.) "is likely to be of the greatest assistance in helping on the cause of no smaller a matter than MEDICAL REFORM!"

In what manner our gracious Sovereign may purpose to wield the staff of Esculapius, along with the sceptre and other regalia of her high office the writer sayeth not; but that strength of arm, as well as "steadfastness of heart" may be required, seems hardly to be doubted.

We have all heard, of course, ere this, something of Her Majesty appealing to the "sense of the country" on the question of corn, sugar, and timber; monopoly, or free trade; tory, whig, or radical. But we are now assured, that the general election will carry with it a decided "medical-reform feature" into the new House of Commons! Whether this signifies, that cheap physic is to be dealt out to those mal-contents who are likely to come short of the *large loaf* I do not know; and it is equally unintelligible to me that those "liberal" men who have been raving against monopolies of every kind during the last two months, should, nevertheless, avow their intention, as soon as they have the power, to fight up for a monopoly in physic—the most mischievous in principle, and tyrannical in operation. How far these worthies will succeed in their meddling interference with the personal and domestic concerns of the people—the people of humble life, who seem to be only as targets for the arrows of the rest of the world—remains yet to be proved.

That the tide of popular feeling is running against those crafty and scheming crochet-mongers, yclept medical reformers, is not to be doubted; that the keen eye of public discernment is able to see through the flimsy gossamer that covers, but does not conceal their selfish principles and intentions, is also not to doubted. They have been denounced by public journals of every party, and all shades of politics. The *Morning Post* and *Herald* were foremost to unmask their presumption. The *True Sun*, the *Sunday Times*, and other liberal papers could not leave these pseudo-liberals unscathed. The *Weekly Dispatch*, which for certain religious (?) reasons has always supported the medical profession, not only could not be a consenting party to the scheme, but in the most handsome and disinterested manner came forward (unsolicited) to denounce the abandoned imposition upon the liberty and pockets of poor people; yea more, the unprincipled attack upon the interests of chemists and druggists.

There is a certain infirmity (and I am sorry for it,) that seems to be frequent and almost indigenous to certain sections of radicals in this country. It is the unfortunate tendency of sublimating reason into presumption. The Political Unions, the National Convention, the Charter (Magna, secunda) are not unapt illustrations of this.

Among the causes of such a propensity, is perhaps a love of distinction, under the pretence of equalization, and not a little, the appetite for mimicking the fashions of the upper classes. The medical agitators, compared to the political, are certainly mimicking *their* superiors in the matter of the Association, the delegates, the medical conference at Exeter Hall, the "long pull, strong pull," &c. for medical "reform," and their "charter" peculiarities. If the political radicals did not accomplish much, they certainly had the merit of producing what is called "a sensation." But in the case of these hapless prodigies of physic in the Strand—

"That strut and fret their hour upon the stage,
And then are heard no more!"

it is but sowing to the wind, with a prospect of reaping the whirlwind. I cannot find, as respects notoriety, that they are at all to be compared with their prototypes mentioned above, or even with the famed Wizard of the North, hard by.

And is the respectable average of the medical profession to be libelled by associating them with such a tribe? Heaven forbid! I firmly believe that the real medical prac-

titioner (by which I mean a man picked out by that most sagacious court of examiners—the public, for the treatment of disease,)—I say the *real* practitioner cares, perhaps knows, as much about "medical reform" as does his "celestial highness the lord of the chinamen" of our queen's attendants of the bedchamber.

Such an estimable character as a sound and upright practitioner of medicine, I do unfeignedly respect and reverence. But when we see, perversely driven into the pale of a noble calling, a clique of creatures that never were intended by nature for such a sphere—when a knot of individuals—the unconfided, the unnoticed, the rejected, or passed-by, of blunt and common-sense English people have the assurance to call themselves the representatives of the medical profession, it is time indeed for fearless observers to remind them of what they are—their origin, and process of formation—to wit, a dishful of inflated bubbles, produced by agitation.

I respectfully conjure the medical profession to wash their hands from all participation with these spouting and idle people, who seek only to beguile them from the more useful and blessed labour of visiting and healing the sick. Let them only adhere faithfully to the path of duty marked out before them, and they need have no apprehension, under a gracious Providence, of losing the rich reward that is due to their exertions; least of all need they fear any injury at the hands of chemists and druggists.

I remain, Gentlemen,
Your obedient servant,
W. G.

MEETING OF THE CENTRAL ASSOCIATION OF CHEMISTS AND DRUGGISTS OF WOLVERHAMPTON.

At a Meeting of the Wolverhampton Central Association of Chemists and Druggists, held at the Swan Hotel, on Friday, the 2nd of July, 1841, John Weaver, Esq. in the chair, it was—

Moved by Mr. Ford, seconded by Mr. Steward, and resolved:—

That the thanks of this meeting are especially due to the members of the council of the "Pharmaceutical Society of Great Britain," for their successful labours in bringing such a society into operation, which is calculated to prove so highly beneficial to the interests of the trade, and be the means of raising it to that eminence in the estimation of the public in which it deserves to be held.

Moved by Mr. Griffiths, seconded by Mr. Parker, and resolved:—

That the cordial thanks of this meeting be given to Mr. Jacob Bell, for his pamphlet of "Observations on the Pharmaceutical Society," which was read to the satisfaction of every one present, and that the secretary be requested to order two hundred and fifty copies for circulation in this neighbourhood.

Moved by Mr. Tonge, seconded by Mr. Fleeming, and resolved:—

That the thanks of this meeting be given to the Editors of "The Chemist," (a work which is entitled to the support of every Druggist) for so kindly devoting their valuable columns to advocate and defend the rights of the trade, requesting them to insert the proceedings of this meeting in their next number, as a means of encouraging others at once to come forward and co-operate with the Pharmaceutical Society in its great object.

Moved by Mr. Bew, seconded by Mr. White, and resolved:—

That this meeting unanimously agree to enrol their names immediately as members of the Society, and recommend the trade generally to adopt the same measure.

Moved by Mr. Jackson, seconded by Mr. Green, and resolved:—

That the members of this Association pledge themselves by every means in their power to forward the interests of the Pharmaceutical Society, with the view of obtaining for it universal sanction.

Moved by Mr. Gow, seconded by Mr. J. F. Seyde, and resolved:—

That the thanks of the meeting be given to John Weaver, Esq., for so efficiently performing the duties of Chairman.

J. F. Seyde, Secretary.

REVIEWS.

A Statement of Facts on the Subject of Medical Reform, Addressed to its Advocates and to the Public at large. By William Collins, Druggist. Bath: Simms and Son, George Street; Oldland, Corn Street, Bristol; and R. Hastings, Carey Street, London. 1841. pp. 15. 8vo.

Pamphlets without number have lately issued from the press, on the most important subject of Medical Reform. In these, the statements of abuses have, indeed, been of a most alarming character. That such numerous and flagrant abuses should exist in a profession to which the health and lives of our fellow-creatures are confided, is a circumstance which calls for prompt and efficient measures of reform; and the individual, whether physician, surgeon, apothecary, or druggist, who calls public attention to them, and who points out means of remedy must ever command our approbation and support.

The total inefficiency of the present system of medical government—the want of a proper and well-regulated plan of professional education—the entire want of qualification, owing to the insufficiency of the present examina-

tions, — and the consequent deficiency, or rather total absence, of protection to the public —are subjects which have too often been treated of in The Chemist to require further notice on this occasion.

The pamphlet under notice is an additional evidence against the abuses existing in the present system of medical government, and the author has manfully and nobly performed his task. He divides his subject into three parts,—" the objects aimed at by the advocates of the proposed improvements ; " — " the equalization of the different ranks of the profession ;—the separation of the trade in drugs from the practice of medicine;—and the preventing unqualified persons from practising." " Leaving the first proposal to those more qualified to decide on it"—he passes at once to the second, and, subsequently, to the third.

" This separation has chiefly been called for on the ground that it would raise the members of an honorable profession to a more dignified station, by freeing them from the stigma of being tradesmen. Desirable as this may be, there are reasons far more urgent, and far more important to the public." These reasons he gives in a very clear manner. We have room only for the following.

" It is plain, that however skilful the medical attendant, however judicious the mode of treatment he may adopt towards his patient— his abilities and care will be of no avail, unless the medicines he prescribes be prepared properly, and with pure drugs. Now, with the present system there is no security that this is done ; and the difficulty of insuring this important object, unless the preparation and dispensing of drugs be made an entirely separate and distinct occupation from the practice of medicine, can be easily shewn.

" In the first place, we need not search very far to see, that where those who supply medicines are responsible to no one for the manner in which they are prepared, and for the quality of the drugs with which they are compounded—where no enquiry is likely to be made as to the efficiency of the persons employed in dispensing them—there will be less probability of such extreme care, in either of these respects, as where the contrary is the case. According to the plan at present so extensively followed, these disadvantages exist in a great degree : the private dispensary of a " general practitioner" is a place secluded from the public view, the secrets of which no one thinks of exploring.* But now that the question of medical reform is agitated, and that more so by this grade of the profession than by any other, they too must expect the same free animadversion on any defects their system may present, which has been so liberally bestowed on others.

* * * * " I will conclude the examination of the imperfections of the present system, by asking, if it is not too serious a consideration, that though the anxious friends of the agonized sufferer may have procured the assistance of the first talent—that though those talents may be successfully exercised in pointing out what remedies would afford relief—there should be such a possibility, that want of proper attention in the preparation of these, may cause all their care to have been in vain, and doom them to see the object of their solicitude sink beneath a disease, which medical science had power to compete with, but which power was rendered unavailable by an unfortunate connexion with pharmaceutical incompetency. Is there not, then, a good foundation for the opinion exercised by the distinguished writer of the letter before alluded to? I presume the trade and profession of medicine must be separated ; our profession can never be respectable or respected, until this separation has been accomplished."

With regard to Mr. Collins' vindication of *The Lancet*, we can attribute it only to his having been overcome by the very *mild* terms in which it spoke of the first meeting of Chemists in London, held on the 15th of February, 1841. Has he read the subsequent false and scurrilous attacks on the body of which he is a member, which have appeared in that journal? Do not those attacks savour of disappointed malignity? Mr. C. says,—

" As to the severe language used by The Lancet, towards the druggists, they might feel more aggrieved at it, did they not observe that the most distinguished members of the medical profession are equally roughly handled by that watchful periodical, when any slight defect or dereliction of duty places them in its power."

Truly, the vituperation of The Lancet is chiefly levelled at the higher classes of the medical profession ; nor do they wait for " any slight defect or dereliction of duty.' The only class at which its venom is not levelled, is that in which most abuses exist; we mean the apothecaries, who, instead of well merited reproof, find in " that watchful journal," an advocate, one too, which is willing to afford them the means of crushing a respectable body of men ; of riding rough-shod over the understanding and common sense of society, and of tampering still further with the public life and health.

This pamphlet should be read by all concerned in this great subject ; it is important and interesting, not only to the profession, but to the public, who will find in its pages an exposé of the manner in which the apothecary discharges his duty to society, when he is

* It is true that the Apothecaries' Company possess a power of examining drugs, but the occasional exercise of it, which has been confined to London alone, has been regarded as a mere form, and is well known to be perfectly useless.

endeavouring to maintain the present absurd system.

A Grammatical Introduction to the London Pharmacopœia, and a Key to Physicians' Prescriptions: containing a Latin Grammar: a Syntactical Analysis of the Pharmacopœia and Preface; and a Copious Vocabulary. By S. F. Leach, *Classical Professor*. Third Edition. London: H. Hughes, 15, St. Martin's-le-Grand.

A more excellent little work than the one before us we have seldom met with. Having been published for some years, and having gone through three editions, it requires no remark from us to add to the estimation in which it must be held by those who have profited by it. We recommend it to our younger readers, to apprentices, and to medical students, as a means of acquiring a thorough knowledge of medical Latin, avoiding the irregular and unsystematic course generally adopted.

OBSERVATIONS ON URINARY SEDIMENTS.*

BY M. BATILLIAT.

The composition of urinary sediments is so much the more useful to be known, as it indicates the treatment that should be adopted. Physicians should, therefore, on all occasions, demand the analysis of urinary concretions from apothecaries, whose office it is to apply their knowledge to the healing art. It is true that all are not equally *au fait* at this kind of experiment; but that arises rather from want of opportunity than from difficulties to be surmounted. Those who are thus situated will find all the necessary information in M. Chevalier's work entitled *Essay on the Solution of the Gravel and Calculi of the Bladder.*

In the course of my practice I have met with *urinary calculi formed of cholesterine.*† (*Journal de Chimie Medicale Nov. and Dec.* 1836.)

I am going to relate two cases which, if they present nothing phenomenal, may at least diminish the anxiety of some persons who attach too much importance to certain symptoms.

At the beginning of May, 1840, a man aged about 30, of good constitution, but who was some times troubled with rheumatic pains, remarked in his urinal a sedimentary deposit, which he did not again see; although there was but a small quantity of it, he collected it, and brought it to me for analysis.

It was composed of small, shining, brick-red crystals. The color diminished after pulverisation.

A portion of this powder, heated in a platinum spoon, gave out a strong urinary, animal smell. The residue, moistened with a little distilled water, communicated a green color to marshmallow paper. A small portion of this same powder, also heated on a sheet of platinum, with a drop of nitric acid, acquired a beautiful red colour, which was turned deeper by ammoniacal vapor.

Another portion of the powder of the sediment was heated in a porcelain capsule, with a solution of pure potassa. After being sufficiently settled, the liquid was decanted in order to separate it from some flocks, which were treated by nitric acid, which dissolved them: saturated with ammonia, the liquid gave a slight precipitate of phosphate of lime. The uric acid was also precipitated from its combination with the potassa, by hydrochloric acid.

From the above results, it may be concluded that the composition of these crystals was analogous to that of uric acid calculi; consequently, and although there was a total absence of all symptoms indicating the presence of calculi in the bladder, this person was sent to Vichy, to take the mineral waters. We shall judge from the other case whether this treatment was indispensable.

At the same time, another person also perceived that her urine deposited much sediment. I directed her to collect it, which she did with care and perseverance for a whole year.

The urine was received during twenty-four hours in the same porcelain vessel, where it was left for twenty-four hours longer. During this time, another recipient was used for the same purpose; the first was decanted, leaving the deposit in it, and so on, until there was sufficient in both vessels; the whole was mixed, washed several times, and dried.

Before speaking of the composition of this sediment, I may relate the following observations:—

The individual who passed the urine was a woman, aged about 53 years, who had never had any affections of the urinary passages, nor of the bladder, but who commonly suffered during the winter from rheumatic pains. When these manifested themselves, or any other indisposition, her urine became turbid and red; the same effect was produced by unusual exercise; but in all cases, it appeared and disappeared from the evening until the next day. In health, the urine was limpid, of a more or less deep amber color, according to the season, never carrying with it foreign bodies. Therefore it was only after it was passed that the

* *Journal de Chimie Medicale, July*, 1841.

† Madame T—, who passed these calculi, is now in the enjoyment of excellent health, although her urine is occasionally accompanied with similar ones,

sedimentary crystals were deposited in it. Wishing to ascertain whether or not the sediment was formed under the influence of atmospheric air, I accurately filled a flask with urine as it passed from the bladder, and I sealed the flask with emery. Twelve hours after, there was a deposit exactly similar to that in the urinals: the liquid, poured into another flask, yielded a second deposit.

From this simple experiment, it is evident that the air does not exercise any influence over the formation of the sediment, and that it is only after a very long time that this deposit is entirely formed.

I should mention, that the smaller the quantity of urine is, as in hot weather, the more abundant is the deposit. This is also probably the reason why urine, passed after meals, deposits almost nothing.

I may add that the production of the sediment appears to be owing to the individual constitution, and not to the kind of diet, since this patient is the only one in her family affected.

The sediment in question was of a brownish red, granulated, and without a determinate form; it was almost insoluble in warm water, and ether did not dissolve it.

I treated ten grammes of it by known means, and I found it to be composed of—

Uric acid.....	9·50
A substance insoluble in caustic potassa	0·02
Water of crystallization and loss..	0·48
	10·00

The matter insoluble in caustic potassa was treated by nitric acid, which dissolved a small portion of it, which was precipitated in flocks by ammonia. The surplus, heated to redness, gave out an odour of animal matter, but it was not entirely burned.

This sediment is evidently entirely composed of uric acid, minus $\frac{2}{1000}$, containing traces of phosphate of line, animal matter, and a substance not acted on by nitric acid, which may be carried away by the air in vessels left uncovered.

QUANTITY OF SEDIMENT COLLECTED DURING TWELVE MONTHS.

1840.	June	5·60 gram.
	July	5·80
	August	10·00
	September.....	3·05
	October.....	1·60
	November.....	2·22
	December.....	1·90
1841.	January	2·60
	February	2·40
	March	3·10
	April	5·30
	May	7·23
		50·80

This quantity being increased by about $\frac{1}{8}$ for lost urine, the whole quantity for the year was 49 grs. 2 decig.

The emission of so large a quantity of sediment would have caused alarm in the case of a person not in good health. The individual in question, had not any indisposition during the whole course of the observation: only, in the months of December and January, she experienced some slight sensations of pain. The sediment collected during these two months, was not granulated and crystallized as in general; on the contrary, it was in fine laminæ, and of a brighter red. Its analysis did not present any distinguishing feature.

From the preceding it may be concluded:—

1st. That it is important not to confound gravel passed by the urine, with sediments formed in it by rest:

2nd. That it is necessary to study the nature of both:

3rd. That urine may deposit more or less abundant sediments, without the health being affected, and, consequently, that medical treatment is not always necessary.

POISONING WITH GUN-BARREL BROWNING.*

BY R. H. ALLNAT, M.D.

To the Editor of The Medical Gazette.

SIR:—

A few months since, as I was walking through the streets of this town, in company with Mr. Atkinson, surgeon to the Union, a respectable tradesman, of the name of Beckley, rushed up to us with a death-like countenance in a state of the utmost trepidation, exclaiming that "his son was poisoned." We immediately proceeded to his residence, and found a child, about five years old, sitting upon its mother's knee, making ineffectual attempts to vomit. He complained of a constant burning pain at the epigastrium, a peculiar sensation in the throat, and the pulse was feeble and quick. He looked listless and heavy, but was perfectly rational, replied promptly to questions, and was extremely obedient in adopting the measures of relief which we recommended.

It appears that his father, who is a gunsmith, had left a bottle containing "browning" within reach, and, during his temporary absence, the child had swallowed a considerable quantity of its contents. Gun-barrel browning is composed of bichloride of mercury, sulphate of copper, and the tincture of the sesquichloride of iron; a precipitate is the result of the union of these heterogeneous ingredients.

The first object was to neutralise the bichloride of mercury, if any existed in a free and uncombined state; to effect which, copious

* *Medical Gazette*, April 9, 1841.

draughts of milk, combined with whites of eggs, were administered. The successive doses, owing probably to the emetic action of the sulphate of copper, were ejected after short intervals, in a partially coagulated state. The poison having at length ceased to act upon the stomach, or the organ having become insensible to its action, a slight ipecacuan emetic was given, followed by draughts of milk: vomiting was renewed, the pulse became more natural, a gentle perspiration broke out, and the child was taken to bed, where he soon fell asleep, and awoke quite convalescent.

Remarks.—The quantity of corrosive sublimate swallowed could not have been very considerable, as a pint of the mixture contained only about a scruple of the salt, with the same weight of the sulphate of copper. All authors, however, agree in assigning dangerous properties even to a minute dose. Orfila, Campbell and Smith state that three, four, or five grains will cause death in the course of the second, third, fourth, or fifth day. Irritation of the alimentary canal, the first symptoms of poisoning, had been clearly induced, and as manifestly allayed, almost instantly, by the antidote. Professor Orfila has related many satisfactory experiments in proof of the virtues of albumen in destroying the corrosive qualities of bichloride of mercury, and converting it into the comparatively harmless albuminous protochloride. Peschier considered that the white of an egg is sufficient to render four grains of the poison innocuous. Dr. Christison also remarks, that the prompt exhibition of albumen, just as the symptoms of uneasiness appear, prevents further ill consequences.

With regard to the salts of copper, Orfila found that albumen is also the surest antidote to their poisonous qualities, and his experiments have induced him to recommend that substance in preference to any other. He found that when 25 or 36 grains of verdigris were mixed with the whites of six eggs, the poison which, if pure, and administered alone, would have caused death in three hours, did not produce it for seven days; and had no effect whatever for five days, also in some experiments the œsophagus was tied to prevent its expulsion.

ON CROTON OIL IN NERVOUS DISORDERS.*

BY JOHN COCHRANE, ESQ.

In the second number of the *Edinburgh Monthly Journal of Medical Science*, p. 128, I observe a few remarks in reference to the efficacy of croton oil, as employed by Sir C. Bell, Drs. Newbigging and Janelli, in certain nervous disorders. It is my favourite remedy in affections of this description, and my experience of its peculiar efficacy is of several years' duration. In epileptic disorders, I have, I may say, invariably found it highly satisfactory to myself, and of the greatest advantage to the patient, by its speed in subduing the violence of the fits, and inducing a calm and tranquil condition. In confirmation of what I thus state, I subjoin three cases.

Some time ago, I was called to attend a patient aged about 30, of a strong and robust constitution. When I first saw him, he was outrageous, and could not easily be managed by four strong individuals. His gestures, deportment, and violence were such as would have induced many practitioners to have had recourse at once to the strait jacket, but to me they occasioned little alarm, as I knew well the certainty of my remedial agent speedily producing an effect, at once useful to the patient, and gratifying to those around him. I prescribed as follows:—

R. Ol. Tiglii gtt. x.
Muc. G. Arab.
Syr. Simp. ā ā ʒi. Misce.
Sign. Give a teaspoonful every ten minutes till he becomes calm.

Half an hour had scarcely passed when he became quiet, and at the end of an hour he had so far recovered as to be able to sit up in bed, and give rational replies to every question; whereas, before he got the medicine, he could scarcely articulate one word distinctly. Under the use of the above remedy, this individual ultimately so far recovered as to be able to follow his usual employment as a house-painter.

In December, 1839, I was called to attend a female patient, whom I found in bed, completely prostrate, and apparently insensible to all around her. In fact she was completely comatose; her pupils were greatly contracted, her pulse could scarcely be felt, and, in fine, she seemed all but sunk into the sleep of death. The remedy which I employed in this case was the croton oil, in combination with mucilage and castor oil, thus proportioned:—

R. Ol. Tiglii, gtt. viiij.
Ol. Ricini, ʒiij.
Mucil. G. Arab. ʒj. Misce bene.
Sign. Enema. To be administered in a quart of gruel.

Though I employed the above potent remedy, I must say, I scarcely expected any good to result from it; but, to my great joy and satisfaction, it had a most beneficial effect upon the patient, not by producing an alvine torrent, but by occasioning a very copious discharge from the bowels *per anum*, as well as from the stomach, by vomiting, together with a return of sensation and motion, and the use of her mental faculties. Indeed, the effect of the medicine was truly astonishing, for when

* *Edinburgh Monthly Journal of Medical Science*, No. VII. July, 1841.

I left her, she seemed all but dead. On my second visit, only a few hours afterwards, she was able to sit up in bed, and converse with those around her.

The following case I deem of great importance in regard to the effects of croton oil. It did not occur in my own practice, but in that of a gentleman in whose testimony I can place the utmost confidence. About two years ago he was called to see a Mrs. E., who had been ill for about a fortnight. Her disease appeared to depend entirely upon obstinate constipation; to remove which, the medical gentleman who had been previously in attendance upon her, had used a great variety of powerful purgatives, which failed to produce the desired effect. My friend was at this time in the habit of prescribing croton oil very freely; and, considering this a good case for its exhibition, he ordered her to take eight drops, which, though a large dose to commence with, proved ineffectual. After a few hours, he repeated the medicine in small doses, till the patient had taken in all fifteen drops, within twelve hours, when the bowels were freely opened. The purging which followed gave immediate relief, and Mrs. E. rapidly recovered, without suffering any injury from the large quantity which she had taken of this powerful oil.

PROCESS FOR DETECTING COPPER IN MEDICO-LEGAL ANALYSES.*

BY M. VERGUIN.

This process was suggested to me by a fact which I observed some years ago, when analysing a copper ore. I had, by chance, put my solution into a platinum capsule, and wishing to obtain the copper in the metallic state, I steeped in it a sheet of iron. So long as the iron was not in contact with the platinum no phenomenon was produced; but the moment they touched, the capsule was covered with a very adhesive layer of copper, and the precipitation was no longer made on the iron: the adhesion was so strong that I was obliged to have recourse to nitric acid to remove it. I did not pay much attention to this fact, and I had almost forgotten it, when it was recalled to my mind, in reading Dr. Christison's process for the determination of mercury, and I sought for a simple process which might be applied to the detection of copper in medico-legal analyses.

Before entering into a description of my process, I may briefly examine the various reagents employed, their degrees of accuracy, and the cases in which they are insufficient. These reagents are ammonia, ferrocyanuret of potassa, and metallic iron.

* *Journal de Pharmacie, June* 1841.

Ammonia acts by dissolving the oxide of copper, acquiring a fine blue colour. This coloration may be with difficulty perceived: 1st, if the tested liquor contain a salt whose base is precipitable by that reagent, for then the precipitate masks it; 2d, if it be colored by an organic substance. Indeed, it may be filtered and decolored with animal charcoal, but when we have but a small quantity of substance to operate on, and when it is of very great importance, the manipulations ought not to be multiplied.

Prussiate of potassa detects small quantities of copper; but the liquor must be pure, and particularly free from iron, for it is impossible to distinguish the brown colour of the salt of copper mixed with the blue colour of the salt of iron.

Iron acts, by decomposing the salt of copper, and precipitating the copper in the metallic state, as represented by the following formula:—

$$(\dot{Cu}\,\ddot{S}) + Fe = Cu + \dot{Fe}\,\ddot{S}$$

in which it is seen that the iron takes the place of the copper, and that, after the operation, we have sulphate of iron and metallic copper. But the liquor requires to be slightly acidulated; but if too much be added, and if the copper is found in small quantity, the iron turns black, and thus prevents the copper from being easily distinguished. Besides, the copper does not adhere to it, and the slightest touch removes it.

These objections do not exist in the process which I am about to describe, and which is only the application of the fact already mentioned.

If the liquid to be examined be dilute, it must be concentrated, then slightly acidulated with hydrochloric acid; a drop must be placed on a sheet of platinum, which must be covered with a well cleaned sheet of iron, so that the iron may touch both the liquid and the platinum; in a few seconds the platinum presents a very adhesive layer of copper on the part occupied by the liquid.

The explanation of this fact rests solely on the electro-chemical theory: it is founded on certain principles which I will briefly enumerate:—

1st, When two metals are put in contact, electricity is produced, one of the metals is positively, and the other negatively, electrified.

2d, If a solution is submitted to the action of the pile the salt is decomposed, the acid goes to the positive, and the base to the negative pole: there are salts which are not only decomposed into acid base, but the base itself is decomposed into metal and oxygen: in this case, the metal goes to the negative pole, and the oxygen, with the acid, to the positive.

Now, if iron and platinum be put in contact there is a development of electricity, which is rendered still more active by the presence of a

saline solution; the iron is positively electrified, and the platinum negatively. The salts of copper possess the property of being decomposed not only into acid and oxide, but the oxide itself is further decomposed into metal and oxygen. Thus the acid and the oxygen go to the iron, which is the positive pole of this pile, and the copper remains on the platinum, which is the negative pole.

This process is very accurate, and does not present the uncertainties of other methods; it is very simple, not requiring any manipulation which cannot be made by every person provided with some chemical knowledge, and I think that it will be very useful in medico-legal investigations.

ON AN ANTIDOTE FOR THE SALTS OF COPPER.*

BY M. BENOIST.

Liquid albumen, which has the property of decomposing and precipitating all the saline solutions of the metals of the four last classes, forming compounds of albumen, metallic oxide and mercury, is now almost exclusively employed as a counter-poison for the salts of copper.

But we labor under a very serious mistake, in a case of poisoning, after having induced and facilitated vomiting, if, gorging the patient with a greater quantity of albumen, we hope thereby more certainly to neutralize the poison: what would happen? the cupreous precipitate would be dissolved in the excess of albumen; if, on the contrary, too small a quantity be employed, it would be dissolved in the too abundant salt of copper.

There are no means of obviating this inconvenience, because we do not yet know what proportion of albumen is capable of neutralizing a given quantity of any cupreous preparation. Again, when it is positively ascertained, the portion left in the stomach after vomiting, never can be known.

I am about to propose another agent which does not present the same objections; I mean dissolved carbonate of soda, which has the property of forming with the cupreous compounds, green precipitates of carbonate of copper, insoluble in water, a species of artificial malachites, such as we prepare in our laboratories, by the double decomposition of sulphate or acetate of copper by the carbonate of soda.

It is on account of its insolubility in water, that this salt has no action on the animal economy. I have tried experiments on animals: to some I have given acetate, to others, sulphate of copper, and to others, the alkaline solution and the poisonous substance at the same time. In all cases, I may say, I have obtained satisfactory results. I administered saturated carbonate of soda to a moderate sized dog, to the amount of 35 grammes. This quantity, although more than sufficient to neutralize the poison swallowed, did not give rise to a single bad symptom: I am of opinion that this salt may with impunity be carried to a very high dose, since in the case of which I speak, it produced only a few alvine evacuations. The great quantity of carbonic acid which it contains, prevents it from possessing the same causticity as the other alkaline carbonates. Hitherto, I have not had an opportunity of applying it to cases of poisoning in man. I may mention that, to prevent loss of life, it is alway indispensable to excite vomiting, in order to expel as much poison as possible.

Let us call to mind the period before M. Orfila had brought the science of toxicology to its present high state of perfection: what means then had physicians of combatting poisonings produced by the preparations of which I speak? Sugared water: and this means having succeeded, how is it explained? It was, doubtless, because the carbon of the sugar procuring from the water and oxide of copper, oxygen sufficient for it to pass to the state of carbonic acid, the same reaction as that treated of in this note was obtained.

We have moreover a recent example of the action of sugar under such circumstances, in a case by M. Lesage relative to a young man who, for some love troubles, had resolved to poison himself, but having by chance taken a very sweet drink before taking the sulphate of copper which he had procured for that purpose, the poison was neutralized.

From the preceding we may conclude that if sugar by one of its elements gives rise to the formation of carbonic acid, which forms insoluble compounds with the salts of copper, we ought not to be astonished that carbonate of soda possesses that property in a higher degree.

Milk has also long been considered as an antidote for the cupreous salts: this acid, it is true, removes much of the caseum which it precipitates, in the same way as vinegar acts in the preparation of whey: but it has never been of any great use in these cases, except as an emollient.*

* *Journal de Chimie Medicale*, July 1841.

STRENGTH OF HYDROCYANIC ACID.

To the Editors of The Chemist.

Gentlemen:—

Although I have exceeded the prescribed limits for you to receive communications, yet

* Sulphuretted hydrogen and the alkaline sulphurets, are excellent antidotes for the salts of copper.—Eds. *Journal de Chimie Medicale.*

as the subject is of importance to the dispenser and the physician, and, above all, as the chemist is awfully responsible, I am sure you will devote a small space in your valuable Journal to exposing our mutilated life or death pharmacopœia.

Two prescriptions have come into my hands this morning; the one ordering six minims of acid. hydrocyanic. med. for a dose, and the other, one minim of acid. hydrocyanicum, each for patients under similar circumstances. Now, supposing that Scheele's strength was employed for the former, and the pharmacopœia article for the latter, the result might prove fatal in the one, and totally inert in the other case: and what means have we of distinguishing which ought to be employed? Does the physician direct us? no, not in nine cases out of ten, does the pharmacopœia distinguish the difference in strength of the various preparations of this important agent! Yet the strength of the one as compared with the other, is about five times.

I am, Gentlemen,
Respectfully yours,
J. F.

Putney, 28th June, 1841.

PRESCRIPTION WRITING.

To the Editors of The Chemist.

Gentlemen:—

Conjointly with pharmaceutists in general, I cannot but condemn the indifference with which physicians write their prescriptions, both with regard to accuracy and legibility; nevertheless I regret to find a party reprobating the malpractices of others, who at the same time evinces no less a want of due caution than those whom he censures. Your correspondent, A. Z., admits that many of the prescriptions that have fallen in his way during five-and-twenty years' experience have been *merely* guess work; now this circumstance would appear to me to be equally deserving of censure, as the careless method of writing adopted by physicians. I cannot imagine that the public will be very ready to make distinction between the merits of the individual who writes an illegible hand, or the party who compounds at a guess that which he cannot possibly construe: common honesty would dictate a refusal to prepare that which cannot be correctly and satisfactorily interpreted, setting aside the probable injury attendant upon an improper administration of medicine. Neither can I imagine any good that can be derived from a publication of such statements, but can easily conceive that such a course would tend to create greater distrust in the profession than that which the public is already prone to; it is evident such statements are calculated to increase the existing prejudice against medicine and the faculty generally: under such circumstances the public will be led to think that, what with the negligence of the prescriber and the guessing of the compounder, they may consider themselves fortunate if happily they escape poisoning, and which event is to be attributed more to good luck than management. I am free to give your correspondent credit for showing a little more discretion in adopting the above initials: had he given his name, doubtless he would have found the public not over anxious to show their admiration of his very candid confession.

It is my humble opinion, that in writing the directions for the administration of medicines, the substitution of "plain English" for the "very worst Latin," would be a very beneficial reform; although I dissent from your proposition as far as regards writing the formulæ in English, for the very satisfactory reason assigned by your correspondent. There is little utility in the present system, as in most cases it is accompanied with a verbal direction, and at all times rendered into English by the dispenser; whereby it is attended with risk, from probable misconstruction, owing to the inconsiderate use of contractions, a too great similarity in the termination of words, when so contracted, and the general illegibility of the writing. I will conclude my observations with the very pertinent remarks of Dr. Paris on this subject, together with the following anecdote illustrative of the foregoing statements:—

"It may be proper to impress upon the practitioner the importance of writing his prescriptions in legible characters, and of avoiding all those abbreviations which are not generally understood, or which may be capable of misconstruction."

I will relate an anecdote which is well calculated to illustrate the mischief that may arise from abbreviated prescriptions—"One of our most eminent surgeons, having occasion to direct the application of a lead plaster (Emplast. Lythargyri. P. L. 1787), he abbreviated the term as follows—Emp. Lyth.: in the haste of compounding, the *h*, perhaps carelessly written, was easily mistaken for *t*, and the chemist accordingly sent the Emplast. Lyttæ! As it was applied to the pudenda it is not necessary to state the distress of the patient, and the dismissal of the practitioner, which followed."

I would add, that the plan here intimated is adopted at the present time by some of the most eminent of the faculty, and think it might be generally acted upon, except in a few cases of emergency, where necessity required such abbreviations or idiomatical expressions as are generally understood, and which should in such case be distinctly written.

I am, Gentlemen,
Yours respectfully,
A Member of the Pharmaceutical Society of Great Britain.

St. Marylebone.

CHAUSSIER'S LOZENGES.

R. Opium..... 6 grains.
Camphor..... 20 do.
Sugar ..... 3 drachms.
Mucilage of gum tragacanth, Q. S.

Make forty-eight lozenges. Dose—five, six, and even more, *per diem*.

PECTORAL LOZENGES.

R. Opium..... 1½ drachms.
Sugar ..... 2 pounds.
Mucilage of Iceland moss } āā 2 pounds.
Mucilage of gum arabic }

Make lozenges of twenty-four grains. Dose—ten, *per diem*.

POISONING BY OPIUM.*

BY M. TILLOY.

A PORTER, having by degrees collected sixteen grammes of laudanum (equivalent to four grammes of opium), took it with the intention of destroying himself. He was soon attacked by stupor: his sleep became extremely agitated and convulsive. Being called in in a hurry by his wife, and having examined the liquid which the unfortunate man had swallowed, I administered to him a solution of 15 centigrammes of tartar emetic, and a glyster containing a similar quantity of emetic. Half an hour after, as all the symptoms of poisoning seemed to have diminished, I administered 5 centigrammes of emetic, and the improvement was very evident. Next day, the patient was able to resume his work.

POISONING BY STRYCHNINE.†

BY M. TILLOY.

AT the time of year when, as a judicious measure of security, the police poison dogs, one of these animals, of a large size, was a victim to this precaution, and his master perceived it only when the first symptoms occasioned by strychnine manifested themselves. I administered to the dog 20 centigrammes of acetate of morphia; half an hour after, the vomiting had not increased; but as the animal appeared to me to be still under the influence of strychnine, I continued the use of the acetate of morphia, to the dose of one decigramme. He soon recovered, and six or eight hours after, he seemed to have nothing the matter with him.

Although the morphine had neutralised the effect of the strychnine, I thought that it was not the specific remedy, and I tried the effect of laurel water. Indeed, having administered to a small dog, 5 centigrammes of strychnine, I afterwards gave him a spoonful of laurel water; the animal vomited and was not ill. Next day, I renewed the experiment on him, and I awaited the effect of the poison, that is to say, the complete developement of the tetanic symptoms; I then administered to him a spoonful of laurel water, which he instantly threw up; a fresh dose was administered without being rejected this time, but the convulsive movements, although less violent, had not disappeared; they did not completely yield until the third dose of the laurel water, and the animal soon after recovered his natural vivacity.

* *Journal de Chimie Medicale*, July 1841.
† *Idem*.

IODIDE OF ARSENIC.

IN answer to a correspondent, we give the following from Pereira's *Materia Medica*:—

"This compound is prepared by gently heating in a tubulated retort placed in a sand-bath, a mixture of one part finely pulverized metallic arsenicum, and three parts of iodine. The iodide is afterwards to be sublimed, to separate the excess of arsenicum. The compound thus obtained is an orange-red solid volatile, and soluble in water. If the solution be rapidly evaporated to dryness, we reprocure the iodide; but if we concentrate, and then place the solution aside, white pearly plates are obtained, which, by Plisson are regarded as a periodide of arsenicum, but by Serullas as oxide and iodide of arsenicum (Souberain, Nouv. Traité de Pharm. ii. 613; and Serullas, Journ. de Chim. Med. iii. 601). Iodide of arsenicum is probably composed of 1½ eq. iodine = 137·5, and 1 eq. arsenicum = 38. It has been employed by Biét in the form of ointment (composed of iodide of arsenicum, gr. iij, lard ℥j.), as an application to corroding tubercular skin diseases (Magendie Formulaire)".

ROYAL ORLEANS VINEGAR.

ALTHOUGH, in pursuance of the objects of this journal, it is part of our duty to detect and expose all frauds and adulterations in the commodities of life, it is equally our duty to bring into notice and public estimation, all such articles as are pure in their composition, and distinguished for the perfection of their characteristic qualities.

Among the numerous articles which are subject to various frauds and adulterations, vinegar is one which undergoes every degree of manipulation, by some makers, while, by others, it is manufactured with the greatest care and attention to purity.

In consequence of our attention being called by an anonymous circular, signed "A Chemical Analyser," evidently designed to injure the character of a new kind of vinegar, known by the name of "ROYAL ORLEANS VINEGAR," we deemed ourselves bound to procure a sample, which, after repeated and the most careful and accurate analysis, was found to be

perfectly free from all admixture of extraneous matter, at the same time possessing a flavor so grateful as to give it a very decided preference over the common sort.

It may not, perhaps, be generally known, that by law, vinegar is allowed to contain in a thousand parts, one part of sulphuric acid; in this sample, however, only a very slight trace of it could be discovered, and no deteriorating ingredient, while samples of the common London vinegar which were procured and analysed at the same time, were found to abound with sulphuric acid and other substances, and were thick and unpalatable. We can therefore, without hesitation, affirm that they bear no comparison with the Royal Orleans Vinegar, either as regards purity of composition or delicacy of flavor.

We cannot conclude these observations without expressing our regret and disgust at seeing science prostituted by being made the vehicle for the gratification of malignity and the infliction of private injury, which manifestly are the objects of the composition circulated by "A Chemical Analyser," whose style of composition is as deficient as his orthography; and whose remarks, as relates to science, are a libel on the name, and are such as to evince him to be of the lowest grade of tyros and pretenders. One who accuses others of want of education, ought to possess a far greater portion than does "A Chemical Analyser" exhibit in his circular, when he talks of "foreign ingredients" instead of "foreign articles," for surely he does not mean to call *Bohea tea* an ingredient. His observation that these deleterious "sours may be further concentrated by distillation over the vapor of water," (steam we suppose he means), is perfect nonsense: it were idle, however, to attempt further exposure of folly that carries with it its own refutation. It is sufficient to say, the process, a description of which is attempted in this circular, is a very elegant and effective one, and that the vinegar thus prepared will rapidly come into universal consumption, and take the lead of all others. In conclusion, we would advise "A Chemical Analyser" in future to confine himself to facts; and when next he advocates the cause of "good morals," to recollect that it is inconsistent and absurd to do so at a time when he is setting truth and justice at defiance, and drag ging in science only to degrade it.

To the Editors of The Chemist.

Ashford, July 14, 1841.

Gentlemen:—

Perhaps you will allow the insertion of the following Queries; they may tend to elicit some useful information, and lead to some profitable discussion.

Should you be pleased to admit these, I hope to furnish you with something more worthy a niche in your invaluable periodical, next time.

---

1. What is the form for preparing the solution of gelatine, mentioned at page 126 of your first Volume?

2. In what manner is that article now so extensively used by druggists; I mean the Cret. Præcip., made?

3. Has any person ever discovered a varnish that will effectually resist the action of spirits and oils to cover the gold labels on druggist's bottles? If any one is in possession of such a secret, he would be conferring a lasting obligation on the greater portion of your readers, by communicating it.

4. Query the preparation of Magnes. Carb. *ponderos*; and Magnes. Calc. *ponderos*.

5. What constitutes a patent medicine? that is to say, when are medicines liable to a stamp duty? We see many druggists of the present day offering their "antibilious pills," &c., for sale without a stamp, while others are scrupulously careful in attaching one. Are the parties neglecting so to do liable to a fine?

6. Is there any thing that will remove the disagreeable smell from sperm oil, and leave it perfectly inodorous?

7. Why is the Inf. Aurant. co. P. L. Nov. only ordered to stand fifteen minutes, while the same ingredients in the Inf. Gent, co. and Inf. Caryoph. are allowed *one* and *two* hours?

I am, Gentlemen,
Yours respectfully,
John Fordred.

TO CORRESPONDENTS.

A Continual Reader.—Indigo is distinguished from Prussian blue by rubbing with the finger-nail: the former thus acquires, and the latter is deprived of, a coppery hue. Tables of affinity, &c. are to be met with in most chemical works, especially Ure's Dictionary.

Juvenis is informed that water is not generated by the atmosphere. We recommend him to read some work for information: to give him what he requires to know, would occupy too much of our space.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

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The above-named Company has been formed with a view to introduce to public attention a projected improvement in the construction of Railways, from which it is confidently expected that the most important benefits will be derived by the country at large.

It may suffice briefly to state, that the prominent advantages over the prevailing system which the new principle offers are—

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THE CHEMIST.

I. CHEMISTRY.

BRITISH ASSOCIATION. ELEVENTH MEETING.

SECTION B.—CHEMISTRY AND MINERALOGY.*

President,—DR. DAUBENY.—Vice Presidents—Prof. DANIELS, and Col. YORK.

THURSDAY, JULY 29.

COLONEL YORK took the Chair, in the absence of the President.

THE following are brief but faithful abstracts of the papers read at this meeting of the section.

I.

'ON the Influence of the Ferro-Cyanate of Potash on the Iodide of Silver, producing a highly sensitive Photographic Preparation.' By Mr. R. HUNT.

Being engaged in experiments on that kind of photographic drawing which is formed by the action of the hydriodic salts on darkened chloride of silver, with a view to the removal of the iodide, formed by the process, from the paper, Mr. Hunt was led to observe some peculiar changes produced by the combined influences of light and the ferro-cyanate of potash. He discovered that ordinary photographic paper, if allowed to darken in sunshine, and then slightly acted on by any hydriodic salt, and washed, when dry, with a solution of ferro-cyanate of potash, became very sensitive of light, being changed from a light brown to a full black, by a moment's exposure to sunshine.

Following out this result, he found that perfectly pure iodide of silver was acted on with even greater rapidity, and it thus became easy to form an exquisitely sensitive photographic paper.

The method recommended is as following :—

Highly glazed letter paper is washed over with a solution of one drachm of nitrate of silver to an ounce of distilled water; it is quickly dried, and a second time washed with the same solution. It is then placed for a minute in a solution of one drachm of the hydriodate of potassa in six ounces of water: and, being placed on a smooth board, gently washed by allowing pure water to flow over it: it is dried in the dark, at common temperatures. Papers thus prepared may be kept for any length of time, and are at any moment rendered far more sensitive than any known photographic preparation, except the Calotype, to which it is quite equal, by simply washing it over with a solution formed of one drachm of the ferro-cyanate of potash to an ounce of water. These papers may be washed with the ferro-cyanate, and dried in the dark: in this dry state they are absolutely insensible, but they may at any moment be rendered sensitive by merely washing with cold water. The paper is rendered quite insensible by being washed over with the above solution, and from the photograph thus fixed, many copies may be taken.

Mr. Hunt then proceeded to describe the action of the spectrum on this preparation, and stated that the greatest effect was produced by the least refrangible rays; but that all the rays, excepting the extreme red, acted with energy. The impressed spectrum was, in all cases, distinctly coloured from end to end; and it was found that the colours of superposed media left a corresponding tint upon the paper, but, unfortunately, as the paper dried, the colours faded. These results bring nearer the probability of eventually being enabled to produce photographic pictures in their

* In our next Number, when we have laid before our readers the remainder of the report of the meeting of this Section, we shall make a few observations on the British Association, and on the extent to which science has benefitted by the eleventh meeting. EDS. CHEM.

native colours. All the spectra formed on these papers were surrounded by a marked space, which was protected from the influence of the dispersed light, exhibiting another proof of the fact before noticed by Sir John Herschel and the author, that a class of rays having peculiar negative properties emanate from the edges of the sun.

Spectra and numerous specimens of these drawings were exhibited.

II.

"Some Researches on the Development of the Electrical Force, and an Inquiry into the Natural Properties of the New Element or Product of Electrical Action, mentioned by Schönbein." By F. De Moleyn, Esq., M.A.

Mr. De Moleyn, commenced by remarking, —"That we are on the eve of some extraordinary discoveries in electro-chemical science, which will most probably effect an entire change in the views of chemical relations at present entertained, there can scarcely exist a doubt. The doctrine of substitutions of Dumas—the strong proofs of the identity of silicon and carbon—the fact of the capability of the same body to crystallise in forms belonging to two different systems—the observations of Schönbein, which formed the groundwork of the first part of the subject of the present paper, with various other singular results recently obtained by eminent philosophers, fully sanctioned this opinion. The interesting character of the facts newly brought to light, and the confessed inadequacy of the various theories presented to the world since the commencement of the present century, to explain or reconcile these modern results of laborious investigation, furnished good ground for fresh inquiry, and encouraged new labourers to enter the field of science."

Mr. De M. then proceeded to say, that Professor Schönbein's statement at the Glasgow Meeting, relative to the production of a new element which he called *ozone*, had attracted his attention, from his having, in the course of his electrical experiments, been struck by the peculiarity of the odour which the power of the batteries he employed, produced to such a degree as to determine him, if possible, to solve the mystery.

The present paper contained some of the more important results which he had obtained.

In the report above alluded to, Professor Schönbein stated that the disengagement of the "odorous substance" depended:—

1st. On the nature of the positive electrodes:

2d. On the chemical constitution of the electrolytic fluid:

3d. On the temperature of that fluid.

Mr. De M. added, that his experiments went to shew, that well-cleaned gold and platina were *alone* capable of disengaging the odoriferous principle, and that the more easily oxidable metals, as well as charcoal, did not possess that property at all. The results of Mr. De M's. investigation proved:—

1st. That the disengagement of the peculiar odor was not confined to the less easily oxidable metals:

2d. That, by certain arrangements, all metals, when positive electrodes, may be made to develope the odoriferous principle:

3d. That certain positive metals, not acting as electrodes, evolve this principle:

4th. That charcoal is not an exception to this rule:

5th. That all substances, whether of crystalline structure, or otherwise, possessing the property of appearing luminous by friction, or of yielding sparks when struck, also possess the property of developing, under such circumstances, the "peculiar odor:"

6th. That iron and nickle develope this principle much more strongly than any other metal:

It was easy to account for Schönbein's error in stating that gold and platina only developed the odor, for he applied but one mode of evolving the principle, namely—by using the substances on which he experimented, as positive electrodes in electrolytic fluids; it was therefore clear, that if, as he stated, even gold and platina only produced the odor when clean, it must have been next to an impossibility for him to have evolved it from metals with more easily oxidable surfaces, and therefore in a condition to conceal rather than develope so subtle an element. There could exist no doubt of its evolution from *all* the metals employed by the Professor; but there was a little doubt, that immediately on its disengagement, combination ensued with the particles of the film enveloping the ill-cleaned surfaces of the inferior metals, and thus that all evidence of its existence vanished.

Mr. De Moleyn taking into consideration the possibility of such an obstruction to the disengagement of the odor, contrived an apparatus by which friction might be applied to the surface of the positive electrode, and in every case he found that the odor was evolved more or less strongly.

Schönbein's opinion—that ozone was the electro-negative element of an electrolytic compound existing not only in aqueous fluids, but also in the atmosphere—made it a point of much importance to ascertain whether it could be produced in dry air or *in vacuo*. The Professor himself had remarked that "problems of the highest scientific importance would be raised, in case it should appear that ozone could be produced in dry air."

Mr. De Moleyn accordingly devised different experiments for the purpose of determining that interesting question, some of which he described in his paper. He stated, that ob-

serving the odor to be produced at the points connecting an electro-magnetic machine with the battery, he constructed an apparatus by which magnets were made to revolve within a glass cylinder, which could be exhausted or filled with various gases, at pleasure; by this means he obtained a vacuum, and operated in dry air, collecting the matters evolved over distilled water, and by such modes he clearly proved that ozone could not only be produced in a dry atmosphere, but also in mercurial and common vacua.

In several instances where distilled water had been admitted into the exhausted tube containing the odor, there was a much larger portion of the tube unoccupied by the water than calculation gave as the maximum space for the residual air after exhaustion; thus proving that ozone had been concentrated, or reduced to a substantial condition. On opening the tube, the odor was scarcely bearable, and diffused itself quickly, causing the same sulphureous smell as that prevailing in a place struck by lightning.

These experiments, varied and frequently repeated with similar result, led Mr. De M. to the conclusion, which he hoped would also be entertained by the Section, that Schönbein's ozone—which, for good reasons which formed the subject of a future paper, he proposed to call Electrogen—must be admitted into the list of supposed elements; that it was not, as developed by Schönbein and himself, an union of an electrolytic compound whose nature was unknown; and that probably it existed in combination in various forms of matter, which at present are considered, but which, in reality, are not elementary.

Mr. De Moleyn added, that he was still prosecuting these experiments, and hoped shortly to add considerably to the proofs already adduced. He was quite sure that the results already obtained would be followed, when in abler hands than his, by a succession of brilliant discoveries, proving the opinion at present entertained concerning elementary substances to be sadly at variance with that beautiful simplicity which throughout the universe formed, and still forms, the groundwork of the operations of the great Author of our existence.

Professor Daubeny remarked, that Mr. De Moleyn's communication was of great importance. It appeared to him that the next step to take, would be that of investigating the chemical action of the principle, and he would suggest to Mr. De Moleyn to direct his future inquiries to its combinations with different substances.

Mr. De Moleyn next gave notice of the discovery of a voltaic combination of extraordinary energy. To this combination he had given the designation of the *Calorific Sustaining Battery*, from its amazing calorimotive powers. He stated, that the energy of the combination was such, that with three pairs of metals, exposing no more than six square inches of surface, the battery will liberate five cubic inches of mixed gases per minute; heat to a bright red, six inches of platinum wire, 1-50th of an inch in diameter; and charge electro-magnets proportionally. Mr. De M. added, that the combinations were such that there was no counteraction, so that he had the sum of the affinities instead of their difference. There was also the additional advantage that there were no unpleasant fumes, and that the battery could be made to sustain its power for any period required.

Mr. De Moleyn's papers were received with much satisfaction by the Section.

Friday, July 30.

I.

"On some Instances of Restrained Chemical Action." By E. A. Parnell.

The object of this paper was to add to the list of circumstances which modify or impede the action of chemical affinity, in a force exerted by the presence of water in the sphere of decomposition, producing a force of considerable power, and one whose action has not hitherto been recognised. Its existence has been discovered by observing the want of action of certain gases, and especially sulphuretted hydrogen, when in a perfectly dry state, on substances on which they exert a powerful action in the presence of water. Thus, papers impregnated with salts of lead, mercury, and copper, were protected from the action of sulphuretted hydrogen, if rendered absolutely dry. That the effect of water in permitting action between these same bodies, does not wholly depend on diminution of the force of cohesion, by dissolving either the gas or the salt, is proved by several circumstances:—

1st. This want of action is perceived only with respect to particular salts:

2d. To restore the action, water may be present in a state of combination with the salt, and then can exert no solvent power:

3d. On moistening various dry salts with absolute alcohol, which dissolves six times its volume of sulphuretted hydrogen, and exposing to the gas, still no action ensued.

Considering the nature of the salts on which the action of sulphuretted hydrogen is restrained, it would seem that the function of water in permitting action, is to combine with the acid, which should be rendered free by sulphuretted hydrogen, immediately on its liberation. One equivalent of water is not always sufficient to satisfy the acid, for all anhydrous salts of the oxides of mercury, copper, or lead, can produce one equivalent of water with sulphuretted hydrogen. The action of water may in some measure be compared with that between sulphuric acid of different degrees of strength and metallic iron or zinc.

These metals, as is well known, undergo no change in sulphuric acid, while in this case, as well as when dry sulphate of lead is exposed to dry sulphuretted hydrogen, it would be said all is necessary to produce decomposition. But in both cases water must be added for action to be set up; in the one to unite with the sulphate of zinc about to be formed, and in the other with the sulphuric acid.

But there are some salts of those metals which are not acted on by sulphuretted hydrogen when dry, whose acid or hydracid of its salt-radical possesses but little affinity for water, and to which, consequently, this explanation will not apply. In considering the cause of the want of action here, it must be remembered that in reality sulphur is a weak radical; that if the salt be soluble, a force is called into action when its solution is acted on by sulphuretted hydrogen, which possesses great power over the results of chemical action, namely, insolubility of the sulphuret; and water being present with which the acid can unite when free, it does not follow that decomposition must occur in one case because it does in another under the influence of different forces.

The author concluded by suggesting an explanation of the singular action between potash and carbonate of lime, in presence of a small quantity of water, observed by Professor Liebig,—carbonate of potash and caustic lime being formed. Both caustic potash and carbonate of potash have a strong affinity for water, but of the two, caustic potash the greater; here is sufficient water to supply the demands of the carbonate, but not of caustic potash; the consequence is, carbonate of potash and caustic lime are formed.

II.

"On some Subjects connected with the Sulphocyanides." By E. A. Parnell.

The author referred to a former paper, in which he showed that the substance supposed to be the isolated radical of the sulphocyanides (obtained by the action of chlorine or nitric acid on sulphocyanide of potassium), contained hydrogen as an essential constituent, and could not therefore be regarded as that radical. The present communication consisted:—

1st. In an investigation of the evidence on which this body acquired its character as the radical:

2d. An examination of other reputed sources of this substance:

3d. Of the action of iodine on sulphocyanide of potassium:

4th. Theoretical considerations on the constitution of the sulphocyanides.

Should Mr. Parnell's views as to the constitution of sulphocyanogen, prove correct, it must be viewed as a hexabasic radical, in whose salts each atom of the base must always be of the same name.

III.

"On Manures, considered as Stimulants to Vegetation." By Dr. Daubeny.

In this paper, the author discussed the question as to the sense in which manures may be regarded in the light of stimulants to plants. It is evident that if the term stimulus be understood in an acceptation similar to that in which it is employed with reference to the animal economy, it ought to be confined to bodies which by their presence assist in promoting the secretion and assimilation of the nutritious matters present, and ought not to include such as themselves afford matter for the plant to feed upon. Thus common salt and other condiments are accounted stimulants to digestion, because, without being nutritious themselves, they, by their presence, cause the food to be more readily assimilated.

Now, it becomes a fit subject for inquiry, whether manures operate in the former way or in the latter, and likewise whether the fact that some of them act less beneficially at subsequent periods of their application than they do at first, is to be explained on the recognised principle "that stimuli lose their full effect upon living matter on repetition."

Dr. Daubeny adduced several facts which led him to infer that the nitrates of soda and of potassa operate favourably on certain crops, by communicating to them *nitrogen;* and that the reason why these salts sometimes appear to lose their influence when repeated, and even to leave the land in a worse condition than before, is not from their being stimuli, and, as such, amenable to the law above alluded to, but because the free supply of nitrogen, afforded by the decomposition of the nitrates, would cause the plant to absorb a larger portion of those other ingredients, such as phosphate of lime, silicate of potassa, &c., which are present in only a limited quantity in the soil: thus tending to exhaust it of these materials, and causing thereby a worse crop to take place the following year. Now, though it may be true that the nitrates, considered in the above point of view, in some sense act indirectly as stimuli, it was conceived that the term itself had best be abandoned, as its adoption might lead to an erroneous impression in the mind of the farmer with respect to the proper mode of restoring to the land its original fertility. If the theory suggested by the author be the true one, it follows that the proper remedy would be, not to discontinue the use of the nitrates, but to restore to the land, by the application of bone manure, &c., at intermediate periods, those other ingredients which had been abstracted from it too largely.

In order to determine what materials are wanting, and in what proportions to apply them, independently of the empirical plan of ascertaining by repeated trials the substances

which best succeed in remedying the deficiency, two methods suggest themselves. The first, a very difficult one, is to learn, by a minute analysis of the soil, whether all the ingredients which the crop requires are actually present in it, so as to take care that they should possess qualities equivalent to those which would be contained in the intended crop. The second, a more practical one, is to calculate how much of each substance had been abstracted by every crop taken off the ground, and to add an equivalent quality in the shape of manure.

Daubeny suggested that a kind of book-keeping on this principle should be undertaken on each farming establishment, in which a debtor and creditor account might be made out, of the nitrogen, the earthy phosphates, the alkali, &c., abstracted as crop, and restored as manure each year ; and concluded by directing attention to certain points which require further investigation with reference to this part of the subject. The first of these is, whether nitrates, when introduced as manure, really diminish in quantity and finally disappear after successive crops have been grown upon land impregnated with them. The second is, whether common salt acts as food or as a stimulant to vegetables. The third is, the exact composition of all the several crops cultivated by the farmer, as well as of all the manures he employs, so that he may know exactly the amount of alkaline and earthy salts, as well as of nitrogen, present in each.

The desultory conversation which ensued embraced questions and answers, theoretical and practical, highly interesting and important, inasmuch as the facts elicited thereby may be hereafter applied to the improvement of agriculture. The general impression appeared to be that great advantages may be derived from satisfactory analyses, on a large scale, of soils. These were recommended to be made extensively.

With reference to the use of the nitrates as manures, the principal object to be ascertained is whether or not the nitric acid be decomposed.

IV.

"On the direct formation of Cyanogen, from its Elements." By Mr. G. Fownes.

After referring to the experiments of Desfosses, which tended to show that gaseous nitrogen brought into contact with charcoal at a high temperature, an alkali being present, is absorbed in notable quantity, and a corresponding amount of cyanide produced; and also to the new process of manufacturing Prussian blue, by Mr. Lewis Thompson, (see *The Chemist*, Vol. I., page 20,) in which nitrogen is derived from the atmosphere—the author proceeded to show that the existence of nitrogen in a solid state, in many varieties of charcoal, and the possible presence of ammonia in the nitrogen gas employed, were sources of error against which it was necessary to guard. The author uniformly found, that whenever wood, charcoal, or coke, is ignited in a close crucible with carbonate of potash, at a moderate red heat, abundance of cyanide is always produced, which is never the case with pure charcoal, provided the temperature does not exceed redness. After a few preliminary trials, a mixture of fifty grains of pure sugar charcoal, and fifty grains of carbonate of potash, obtained by gently igniting pure bicarbonate, was placed in a porcelain tube fixed across a furnace and maintained at a full red heat, while pure nitrogen gas, very carefully prepared by acting on a solution of ammonia by chlorine, was slowly passed over the mixture. At the further extremity of the porcelain tube, a small gas-delivering tube was arranged, dipping into a vessel containing water.

At the commencement, the quantity of gas emitted by the exit end of the arrangement greatly exceeded that passed into the tube :— it had no odor, did not render lime-water turbid, and burned with a bright blue flame, generating carbonic acid. After some time the carbonic oxide diminished in quantity, until at length nitrogen alone escaped. The tube, when cold, being examined, was found to contain a black porous mass, which hissed and became very hot on the addition of water. A little of the filtered solution gave, by "Scheele's Test," abundance of Prussian blue; another small portion, acidulated with nitric acid, gave a copious white precipitate with nitrate of silver, and the residue distilled with dilute sulphuric acid (the addition of which scarcely occasioned effervescence) afforded about half an ounce of tolerably strong hydrocyanic acid.

Arrangements were made for repeating the experiment, employing the nitrogen of the atmosphere instead of that artificially prepared, the result of which was, as before, a black mass, rich in cyanide of potassium. The amount of carbonate of potash converted into cyanide by direct absorption of nitrogen, appears to depend very much on the temperature employed. In two trials at a full red heat, the quantity of carbonate converted amounted to 11·5 and 12·5 per cent. of that employed. When, however, the temperature was raised to whiteness, much above the melting point of copper, the production of cyanide appeared much greater. When carbonate of soda was substituted for the potash salt, cyanide was generated, but it seemed with much greater difficulty. The fact, therefore, appeared to Mr. Fownes to be established, that free nitrogen can at a high temperature combine directly with carbon, provided some metal, or similar body, be present whose cyanide is permanent under such circumstances.

The President made a few observations on the illustration which the facts mentioned

by Mr. Fownes afforded of the process by which nitrogen entered into combination with carbon in manure, and also on the probable formation of ammonia in the earth under high pressure.

MONDAY, AUGUST 2.

I.

"A Practical Method of determining the quantity of real Indigo, in the Indigo of Commerce." By Dr. Samuel L. Dana, of Lowell, U.S.

Dr. Dana directs that 10 grains of indigo, reduced to an impalpable powder, should be boiled in a Florence flask for a few minutes, in 2½ oz. of a solution of carbonate of soda, making 30° to 35° by Twaddel's hydrometer, then add 8 grains of crystals of muriate of tin, and boil for half an hour: a beautiful yellow solution of indigo will be obtained. Withdraw the flask from the lamp, and introduce into the solution 500 water-grain measures of a solution of 50 grains of bichromate of potash in 4000 grains of water. The indigo blue, with a trace of indigo red, will be precipitated, while the other components remain in solution. Filter the precipitate through a double weighed filter, washing the mass with 1 oz. of muriatic acid, diluted with 3 oz. of boiling water; wash with hot water till water only returns; separate, dry and weigh the filters; make a note of the weight of the precipitate; burn one filter against the other; the difference is the silica contained in the indigo, which, deducted from the weight of the precipitate, gives the quantity of pure indigo. Mr. W. Crum, who communicated the above, added, that carbonate of soda with protoxide of tin dissolves indigo, and forms a yellow solution, but so slowly, that he doubts if all the ten grains are acted upon. He thinks Dr. Dana must mean soda-ash, which contains a notable quantity of caustic soda; but a much weaker solution of caustic soda would answer the purpose.

II.

"Abstract of a letter from PROF. LIEBIG to DR. PLAYFAIR."

This communication announced the discovery of a white crystalline substance, in large quantity, obtained by M. Schunk from the lichens which are employed in preparing archil (*Lecanora tartarea*, &c.) by extraction with ether. It differs from Erythrine and the compounds described by Dr. Kane, in its insolubility in water. It dissolves readily in alkaline solutions, and is capable of being again precipitated by acids, while the solution is recent; but if kept for some hours, acids produce no precipitates. It has been decomposed, and is converted into carbonic acid, and *Orcèine*.

If the substance be dissolved in baryta-water, and the clear solution boiled, a large precipitate of carbonate of baryta occurs, and the filtered solution gives, on evaporation, large quantities of *Orcèine*. From this circumstance a number of phenomena in the color of lichens can be explained, which Dr. Kane has detailed in his work on that subject. Prof. Liebig also states that he has performed many experiments on the legumin of beans, and some other leguminous plants. He has come to the conclusion, that this body is identical with the casein in the milk of animals. It has exactly the same composition, and contains the same salts—phosphate of potash, potash, magnesia, lime, and iron—as the casein of milk. He also mentions that Drs. Will and Varrentrapp have devised an excellent method for determining the amount of nitrogen in organic bodies. The substance is mixed with a quantity of caustic potassa, and hydrate of soda, and heated to redness in an ordinary combustion tube. All the nitrogen in the substance escapes as pure ammonia, which is condensed in a small and neat apparatus, containing dilute muriatic acid. This solution is mixed with chloride of platinum, evaporated to dryness in a water-bath, and the excess of chloride of platinum is washed from the ammonio-chloride by a mixture of ether and alcohol. From the metallic platinum which remains after the ammonio-chloride is heated to redness, the quantity of nitrogen is to be calculated.

In conclusion, Professor Liebig states that he has repeated all Dr. Brown's experiments on the production of silicon from paracyanogen, but is not able to confirm one of his results. His experiments prove, that paracyanogen is decomposed by a strong heat, into nitrogen gas, and a residue of charcoal which is exceedingly difficult of combustion.

Mr. PARNELL said that he too had repeated the experiments of Dr. Brown, without being enabled to verify any one of his results.

III.

"Some Experiments showing the possibility of Fire, from the use of Hot Water in warming Buildings, and of Explosions in Steam Engine Boilers." By MR. GOLDSWORTHY GURNEY.

From a tubular boiler, driving a high pressure engine, the injection pump was cut off—half an hour after the supply pump was stopped, no water appeared on openiog the guage cocks, and the engine was observed to slacken its rate and to move sluggishly—it had dropped from 50 to 30 strokes a minute. The steam pipe from the boiler to the engine was 40 feet in length, and was carried for convenience through the open air, thickly wrapped round with woollen cloth to prevent radiation: soon after the engine became sluggish, the

woollen cloth was observed to char near the boiler, which soon extended along the whole length of pipe; the engine was still working, but with more apparent difficulty, making only 16 strokes per minute; the pressure gauge, which usually ranged between 30 and 40 pounds, now stood at 15, and was gradually sinking. In about five minutes after the woollen cloth had charred, a lead flange, used as a packing at the cylinder joint, melted, and a loud escape of elastic matter followed. The engine stopped working, and a lighted match being brought into the escapage, set it on fire, and it burnt with the lambent flame of hydrogen gas. The author was of opinion, that the escaping vapor was not pure hydrogen. Water condensed on a piece of cold iron held in the flame, but no water condensed on the cold iron after the flame was extinguished. On examining the boiler, all the tubes were found red hot.

This experiment was repeated with numerous modifications. The temperature of the escaping vapour was determined by means of bars, previously prepared to melt at different temperatures; these indicated a temperature of about 400°. In about eight minutes a piece of pure lead melted — woollen cloth was charred, and a piece of tow held in the escapage took fire. In other experiments it was found, that the pipes acquired sufficient heat to explode gunpowder, and many chemical preparations.

Having satisfied himself of this property of heated steam or elastic matter, formed from the last portions of water in a boiler, Mr. Gurney proceeded to examine, as far as possible, its chemical nature — to determine whether any decomposition, or new elementary formation, took place. He found that the elastic matter was not condensible over cold water, and in many cases would not burn, or show any indications of the presence of hydrogen, or other inflammable matter. In some experiments it extinguished flame. The experiments with copper vessels afforded the same results as those with iron.

From these experiments it appeared, that whenever the heating apparatus becomes short of water, the elastic matter formed over the fire will carry sufficient heat through close pipes, to any distance, to set fire to wood and other combustible bodies, whether or not the hot water apparatus be under pressure, or whether the heating surface consist of tubes, plates, or cylinders. On the other hand it would further appear, from some experiments described, that in no case is there danger when a given quantity of water is present. Mr. Gurney suggests, that if both ends of the circulating series in hot water apparatus, namely, the part which immediately goes from the heating surface beyond the furnace, and that part where the circulation returns to it before it enters the furnace, were made of a metal which would not melt at the fair working temperature of the water, but which would melt at a temperature of from 5 to 600° of heat (say lead pipe), there would be little, if any, danger from fire.

It was mentioned that some experiments made many years since, by Wolfe, on some of the boilers of the Cornish steam-engines, corroborated the facts now stated. It was also mentioned by Mr. Hunt, on the authority of Capt. Tregaskis, that where the boilers had been covered with sawdust, it was found in some instances, and in a very short time, to be charred.

IV.

"On the Disintegration of the Dolomitic Rocks of the Tyrol." By Prof. Daubeny.

The author attempted to explain, without resorting to volcanic agency, the abrupt form, extraordinary height, naked outline, and fissured surface of the dolomitic rocks of the Tyrol. He attributed the above circumstances to the slowness at which decomposition proceeds in rocks, consisting of pure dolomite, and the strength of the cohesion which binds together the particles of this rock; owing to which, even those portions which stand prominent in consequence of the removal, by the agents of destruction, of their contiguous parts, often remain unaffected by those mechanical forces which would cause the projecting portions of a rock less unyielding in its texture to become detached. The cause therefore of the greater height maintained by the dolomites of the Tyrol, than by the pyroxenic rocks which accompany them, seems to be the slower rate at which decomposition has proceeded in the former, whilst the bold and jagged outline they display, may have been produced by the tenacity with which their parts cohere. The sterile character of these same rocks, even in parts which are not precipitous, appears to be owing to the slowness with which they decompose, as well as perhaps to the absence of organic remains. Professor Daubeny concluded with some suggestions as to the means of fertilizing rocks containing magnesia, where from the slowness of their decomposition they continue sterile; and proposed in such cases to accelerate the disintegration, by pouring upon the subsoil diluted sulphuric acid.

Mr. Prideaux thought that great advantage might be derived in the serpentine district of the Lizard, from spreading over the surface a thin layer of the iron pyrites, which being so abundant in the immediate neighbourhood would be very economical. The decomposition which would ensue would yield sulphuric acid to combine with the magnesia of the rock, and oxide of iron, which is well known to favor vegetation.

A Member feared that the arsenic combined with the pyrites of Cornwall would

render their use, as suggested by Mr. Prideaux, highly detrimental.

Dr. Daubeny stated that Mr. Davies Gilbert had informed him, that water impregnated with arsenic was found to be anything but injurious to the growth of leguminous plants. Dr. D. also said that he had made many experiments—watering plants with water containing arsenious acid, and that certainly it did not appear to him to exert any injurious influence, unless the water was very strongly impregnated with it.

V.

"Some Enquiries into the Causes of the Increased Destructibility of Modern Copper Sheathing. By Mr. Prideaux.

Comparative analysis of five select samples of sheathing, compared with two others by Sir H. Davy and Mr. R. Phillips, three of them having worn remarkably well, and three others having been rapidly destroyed, did not elucidate the cause; some of the purest having suffered the most, whilst neither the nature nor quantities of the alloying metals bore any proportion to the durability of the others; the worst of all and the best but one being nearer alike in composition than any of the rest. The analyses were shown in a table. Neither did the physical properties, as hardness, tenacity, grain in fracture, nor colour, present more consistent relations to the wear. The specific gravity only coincided with the durability, the two most durable being also the heaviest. (The samples were shown.) Hence he had recommended the rolling of the sheathing to be finished cold, both to give it more pressure and to harden it against friction.

Not finding the causes of waste in the chemical or physical qualities of the metal; samples of each, of equal surface, were kept immersed, under parallel conditions, in sea water sharpened with sal ammoniac, and the loss of weight of each ascertained. This did not at all coincide with the waste at sea; the most durable having suffered the most, and the least loss having occurred to one of those which had been most rapidly destroyed. (The proportions were given in a table.)—Hence the cause of waste seemed to be rather in external circumstances, than in the properties of the coppers.

Of these external causes:—

The sheathing usually wasted most about the waterline, and down by the bows and the rudder, where it suffered the wash and froth; plainly from *friction* and *oxidation*.

The bottom was less injured in deep waters; but washed when liable to ground upon black mud, by the sulphureous and other corrosive exhalations. The Eddystone tender appeared to suffer in this way.

The nails appeared to exercise an *electro-chemical* influence, in proportion to the great metallic surface they presented, both to the copper and the salt water. This influence had been very apparent on the Jane, a schooner of Mr. Moore's, on which the copper was quite sound round some of the nails, though the rest of the sheet was perished; whilst round others the copper was much worse than in other parts of the same sheet. All the nails he had tried were electro-negative to the copper; and on immersing equal copper slips from the same sheet, in the same sea-water, in contact with different nails, they had been differently acted on; most of them having lost more, than a slip, to which no nail was affixed; but one having lost less, *that* nail having exercised a protective influence, whilst all the others had been destructive.—(The proportions were shown in a table.)—He recommended that nails should always be made protective, so far as was compatible with their own durability, as the most convenient mode of chemical protection. The *increased velocity* and *activity* of merchant ships, must subject them to increased *wear*, and this activity will expose them more to *stress of weather*, still increasing the waste by *friction*.

It is known that the copper suffers most in *hot climates*, where the vessels are also most subject to *electrical* discharges; heat and electricity being both exciters of chemical action.

The Acorn, which had undergone many heavy thunder-storms on the African coast, had lost 16 per cent. of her copper in 2½ years.

The waters of different seas might contain different proportions of corrosive ingredients. The Plover and Jane had their copper, about the water-line, &c., marked with uniform punctures, as if by organic action. Samples had been obtained from different seas, and tried by the immersion of equal slips of the same copper.

That from the Gulf Stream had wasted the copper much more than the others. (The proportions were shown in a table.)—But after allowing for all these *external causes*, the defect seems, too often, to be in the copper itself. The Eddystone tender and Quarantine cutter both lie most of their time in Catwater; the copper on the former came to patch in three years; the latter is still very good after nine years' wear: a difference too great to be accounted for by the former occasionally touching the mud. The Tartar, frigate, had her copper completely destroyed in four years, without ever leaving Sheerness harbour. But it seemed to little purpose to proceed with comparative analyses, until the different characters of the coppers have been proved, by their wear under *similar* circumstances.

For this purpose he recommended that vessels should be sheathed with different coppers on their two sides, all fastened with the same

nails. Thus the shipwright would learn whose copper he could best confide in, whilst supplying the chemist with materials for ascertaining the causes of the difference in quality. Meanwhile he recommended the nails to be made slightly electropositive to the copper, as a *chemical* preservative; and coal tar laid on hot upon the copper also heated, as a *mechanical* protection against friction.

The Eddystone tender had her water line, &c., fully protected by a mere coat of seal oil; and Mr. Moore's Jane had most strikingly shewn the protective quality of coal tar by the perfect preservation of the lines over which coal tar had trickled, whilst the rest of the sheet was quite destroyed. This specimen was exhibited on the table.

The Jane had been sent to sea with her two sides differently sheathed, and her fore quarters varnished hot with coal tar.

VI.

"New Extemporaneous Process for the Production of Hydrocyanic Acid for Medical Use." By R. D. Thomson, M.D.

The importance of prussic acid as a medicinal agent, has induced Dr. T. to bestow much attention upon its production, so as to obtain it always of uniform strength. Having tried all the processes which have been recommended in this country, for the formation of prussic acid, he was satisfied that none of them afforded an acid of always uniform strength. The process recommended by Dr. Clark, of Aberdeen, was superior to every other, but an objection to his process was the great difficulty of procuring pure cyanide of potassium.

The author believes the following process to be less liable to objection than any at present used:—

The first step consists in forming a pure cyanide of lead. This object may be effected in various ways, either by precipitating acetate of lead by hydrocyanic acid, as prepared from the ferrocyanide of potassium, and sulphuric acid, in a stoppered bottle, or by distilling the mixed materials into a Wolf's bottle, containing a solution of acetate of lead. In either case a definite compound of cyanogen and lead will be obtained, which is to be carefully washed and gently heated. The next step in the process consists in decomposing it, by sulphuric acid.

In order to obtain an acid of the strength of the *Acidum Hydrocyanicum dilutum* of the London Pharmacopœia, that is to say, containing about two per cent. of absolute acid, the following formula is recommended:—

Cyanide of lead	43·36 grains.
Dilute sulphuric acid, L. P.,	2 fluid drachms.
Pure distilled water.....	6 do.

Put the cyanide of lead into a stoppered bottle; mix the acid and water in a glass vessel; allow the mixture to cool, and then pour it upon the cyanide of lead. Put in stopper, and shake the fluid and salt together. After standing for some time, pour off the supernatant liquor from the precipitated sulphate of lead, and preserve it in a stoppered bottle.

This formula is based on the circumstance that the dilute sulphuric acid of the London Pharmacopœia contains in each fluid drachm about 9·5 grains of oil of vitriol—

$$(S O_3 H O),$$

2 drachms will therefore contain 19 grains of oil of vitriol. The quantity required for saturating 43·36 grains of cyanide of lead is only 17·4 grains, but the small excess is useful in preserving the acid.

LONDON ELECTRICAL SOCIETY.

Tuesday, August 17.

IMPORTANT DISCOVERY.—"ON A VOLTAIC PROCESS FOR ETCHING DAGUERREOTYPE PLATES."

BY W. B. GROVE, ESQ., M.A., F.R.S., PROF. EXP. PHIL. LOND. INST.

Our readers are now well aware of the great success which has continued to attend the application of M. Daguerre's discovery of the action of light upon certain salts of silver. The thoughts of the scientific world have long been directed towards the means of multiplying the pictures obtained; but, until now, without success.

Prof. Grove has been for some weeks past carrying on a series of experiments, which have happily terminated most successfully. At this meeting of the London Electrical Society, he was enabled to exhibit a considerable number of prints from these plates, and also some electrotype copies of the same. The whole art is the pure result of inductive reasoning.

It has been long maintained that in these pictures, the dark parts are silver, and the light mercury. Assuming this to be true, it occurred to Mr. Grove, that if some electrolyte could be discovered, with an anion active, when free, on one metal and not on the other, an etching might be obtained. In this he was not successful; for the elements active on silver were also active on mercury. He then sought a compound involving an element *more* active on one than on the other. This, after many experiments, was found to be present in dilute hydrochloric acid. When this is electrolysed for a few seconds, with a platinized platinum cathode, and a Daguerréotyped picture for an anode, the latter is delicately and perfectly etched.

The etching is so fine that the lines (copies from the well-known faithful picture) are even too fine to réceive the molecules of the

printer's ink; and hence it is absolutely necessary to continue the process at the expense of what would else be microscopic truth.

The prints thus obtained are very good; they seem to be more distinct than the originals; for the vision is not disturbed by the reflected light. The author, at the conclusion of his communication, says, that now "instead of a plate being inscribed as 'drawn by Landseer and engraved by Cousins,' it would be 'drawn by Light and engraved by Electricity.'"

Besides this paper, were read several others of considerable interest. Mr. B. Hill, "*On a new Electro-Magnetic Machine.*" In this machine the *sum* of two powers is obtained instead of the *differences*, as in other instances.

"*Description of a smaller Atmospheric Electrical Apparatus.*" W. H. Weekes, Esq. A paper replete with the results of long experience.

"*Further Observations on Electrotype Manipulation. — Fusible Metal.*" Charles V. Walker, Esq., Hon. Sec. The ingredients of a very manageable alloy are here given, and explicit directions on the subject of Clichée medals generally. The paper will be found worth reading by those who copy medals by the art of electrotype.

"*Methods of giving more force and constancy to the current of Galvanic Batteries, formed by a single liquid.*" Prof. Poggendorff, (Translation.) This was a description of several modes of preparing copper in a manner analogous to the platinization of platinum. Batteries constructed with metal thus prepared, possess a power little suspected by those who have not employed them.

"*Monthly Register for July of the Electric, &c., condition of the Atmosphere.*" W. H. Weekes, Esq. This valuable monthly document cannot be too well spoken of: it is prepared with very great diligence, and contains a mass of statistical information not elsewhere met with.

ON THE IODIDES OF POTASSIUM AND SODIUM.*

BY M. JUVENAL GIRAULT.

IODIDE OBTAINED WITH POTASSA ADULTERATED WITH SODA.

By making use of crude potassa for the preparation, by solution, of iodide of potassium, if the iodide of potassium were not alterable, and if the iodate were not susceptible, as remarked by Mitcherlich, of contracting, under certain circumstances, a peculiar crystallisable combination with this iodide, the product should be a pure and simple mixture of the compounds of sodium and potassium with iodine. On account of the extreme deliquescence of the iodide of sodium, the last crystals would contain most of that iodide, and the first, on the contrary, would be almost entirely formed of iodide of potassa; but the salt obtained from an operation of this kind has a much less simple composition. The crystals which are obtained from the liquors from which the iodate has been separated by simple concentration are formed of iodide of potassium, carbonate of soda, and iodate of potassa and soda in variable quantities; those obtained from the crystallisation of the residue of the calcination are formed of iodide of potassium and sodium, and of a considerable quantity, this time, of carbonate of soda. The possibility of this composition will be evident, I think, from the examination of the special properties of each of the halogen compounds of which I am about to treat.

* *Journal de Pharmacie, July* 1841.

IODIDE OF POTASSIUM.

There exists only one well-defined iodide of potassium; it is that which corresponds with the protoxide of that metal. Under the improper names of biniodide and teriodide of potassium—names which the single relation of the composition of the peroxide with the teriodide seems to warrant, we designate the solution, in a solution of neutral iodide, of a quantity of iodine equal to, or double, that which the salt in solution contains: such are those semi-combinations employed by M. Lugol, and since, by others, under the several names of *rubefacient iodureted solution* and *caustic iodureted solution*.

That which is called iodide of potassium in commerce is the fused iodide; the hydriodate is the crystallised iodide, which should not contain water, but which retains it in quantities varying from 2 to 10 per cent.: is it only on account of this water that the fused iodide has long fetched nearly double the price of the hydriodate? Assuredly not. The reason is, that in preparing the fused iodide, there is a considerable loss.

When exposing iodide of potassium to the action of heat, the temperature is raised, the crystals are destroyed, undergo igneous fusion, and very soon disengage abundant vapors, being volatilised without decomposition, even in contact with the air. Oxygen and carbonic acid have no action on this salt; nor does it undergo any alteration when exposed to the air, whether wet or dry: a current of carbonic acid and one of oxygen simultaneously directed through a solution of this salt did not effect any modification in it, even at a temperature of 80° C.

When iodine is gradually added to a cold concentrated solution of potassa, the lower part of the liquor immediately turns of a brown-red color, then, by the slightest agitation, this color is communicated to the whole of the

liquid, and the iodine is almost immediately and entirely dissolved, accompanied by a disengagement of heat; and if an excess of iodine has not been used, the liquor gradually loses this color, again becomes limpid, and at the bottom of the vessel is found some iodate partly precipitated; another portion of this iodate is dissolved in the iodide; that is because this salt, almost insoluble in pure water, is much more soluble in the solution of iodide of potassium, and because, under the influence of an excess of alkali, a basic iodate is formed, which is still more soluble. To avoid the influence of an excess of alkali, let the iodine be used in excess; this iodine is energetically retained, and nothing less than complete desiccation, almost to fusion, is required, to entirely volatilise it. When the residue is then treated by a small quantity of water, the iodate is almost wholly separated from it: there remains only to decompose it at a temperature not capable of volatilising the iodide resulting from its decomposition.

IODIDE OF SODIUM.

Sodium combines with iodine, and, like potassium, forms with that metalloid a compound corresponding with its first degree of oxygenation. The iodide of sodium, like that of potassium, and all the soluble iodides,—the fact may be generalised,—is capable of dissolving a certain quantity of iodine; but it disengages it with great facility, and in this respect it differs from the iodide of potassium. It is capable of crystallising in flattened rhomboidal prisms, longitudinally striated, of a lamellar texture, and perfectly transparent; its crystals contain 24 per cent. of water of crystallisation: when sufficiently dried, if exposed to rather damp air, they absorb moisture and fall into a state of deliquescence: if the air is too dry, they effloresce; if too warm, they liquify in their water of crystallisation. To obtain them in such a state as that they may be preserved, they must be placed between some folds of blotting paper, spread on a sieve, and placed in an oven heated to 25° C., and left there only so long as may be necessary; they must then be immediately enclosed in a previously dried flask sealed with emery: this flask should be of sufficient size to hold the dried salt, but no larger. These precautions are indispensable to its conservation. If the crystals of this salt be exposed to heat, they lose their water of crystallisation, effloresce, then the iodide enters into fusion at an elevated temperature, and finally, if the temperature be sufficiently high, it is volatilised, but at a much higher temperature than is required for the volatilisation of iodide of potassium; efflorescence, fusion, and even volatilisation, take place without alteration out of contact of the air. On cooling, the iodide solidifies, acquires a pearly appearance, and, removed from the influence of the air, it may be kept for an indefinite period. If this salt has experienced the contact of the air, it is quite otherwise: iodide of sodium contained in a perfectly sealed bottle, but of whose capacity it occupies only a portion, acquires a red color, which becomes more and more intense if the bottle be occasionally opened; this is because, on account of the air contained in the flask, part of the iodide is decomposed, passing to the state of carbonate of soda, and disengaging its iodine, which communicates a rose tint to the salt: but if, placing a certain quantity of this iodide in a glass retort, it be submitted to a heat sufficient to effect its fusion, and then, after cooling, if the air be allowed to enter, the latter rushes into it, acts only on the surfaces which it can reach, and by its carbonic acid and oxygen forms carbonate of soda and iodu-retted iodide.

Iodide of sodium is excessively deliquescent, and consequently, very soluble in water; alcohol likewise dissolves it when it is not too concentrated. A solution of this salt exposed to the air undergoes only an excessively slow alteration: the crystals of this iodide are much more rapidly altered, and the anhydrous salt still more quickly; also a mixture of iodide of potassium and sodium being given, it is only by a desiccation carried almost to fusion, and successive exposures to the air and to heat, that iodide of sodium can be converted into carbonate of soda.

A current of carbonic acid driven into a solution of this salt does not cause it to undergo any alteration, even at a temperature of 70° or 80° C. A current of oxygen, driven into it simultaneously with the carbonic acid, does not render the action more effectual, yet this salt, in contact with the air, cannot be preserved.

When iodine is projected into a very concentrated solution of caustic soda (36° cold), it goes to the bottom, turns black, loses its metallic lustre, and gives a slight amber color to the liquor: the liquid gradually turns yellow, and the iodine, being covered with a white, opaque layer of iodate, acts no more. If the solution be now diluted, or if in the first instance a weak solution was used, the reaction is operated in the same manner as with potassa, with the difference, however, that it is impossible to obtain iodide of sodium free from carbonate of soda, and, consequently, from iodu-retted iodide: that iodate of soda, being susceptible of combining with iodide of sodium, remains in solution notwithstanding the concentration of the liquors without heat, and that if they be submitted to heat, the greater part is precipitated on account of the destruction of the compound of which it made part, but that some of it still remains in the state of simple solution; that, moreover, from the time of the calcination of the iodate and the iodide, soda is again made, and that an alkaline iodide is

obtained: this iodide ought, therefore, to be prepared by double decomposition.

A circumstance in which the alteration of the iodide of sodium is rendered particularly evident is as follows:—

Having treated the proportional mixture of iodate of potassa and iodide of potassium obtained from a caustic solution by charcoal, I saw a continuous disengagement of carbonic acid without the slightest loss of iodine, and the washed residue gave pure white, and neutral or scarcely alkaline iodide; then the same experiment having been repeated with the corresponding compounds of soda, gave abundance of iodine during the calcination, and the iodide obtained was mixed with carbonate of soda, which crystallised in the liquor. It is therefore by analogy, without doubt, that in M. Orfila's work,—the only one, perhaps, in which the excellent practice of calcining the mixture of iodate of potassa and iodide of potassium with wood charcoal is detailed and recommended,—that chemist, in the article on *Iodide of Sodium*, gave the same process.

Without seeking to draw from the preceding facts more important conclusions, it may be said that there is an advantage in preparing iodide of potassium by double decomposition, and that, on the contrary, iodide of potassium may advantageously be prepared on the large scale by the caustic solution, taking into the account the solubility of iodate of potassa in the iodide, and calcining the mixture of the two salts with charcoal, which would allow of the decomposition of the iodate at a very low temperature, so as not to volatilise any of the iodide of potassium. It must be borne in mind that this simple and convenient *modus operandi* is not applicable to the employment of the potassa of commerce, which contains soda and sulphate.

The preparation of iodide of potassium by double decomposition, being disengaged from all accessary phenomena, and requiring no other apparatus than those which all apothecaries have at hand, may for these reasons sometimes be preferred; it is ordinarily executed by means of iodide of iron: but as this iodide is eminently alterable, and presents very serious inconveniences, it appeared to us useful to examine whether zinc, the use of which was feared would not offer peculiar advantages, and whether it really presented the inconveniences attributed to it.

PREPARATION OF IODIDE OF POTASSIUM, BY MEANS OF IODIDE OF IRON.

In treating iodide of iron by carbonate of potassa, the precipitate of hydro-carbonate which is formed retains a considerable quantity of iodine, apparently kept in a peculiar state, for it can be removed only by repeated and long boiling. The coagulated condition of the precipitate renders filtration very slow. Another difficulty arises from the nature of the precipitate, that of accurately ascertaining when the saturation is complete, and in order to do so, time must be given for the liquors to settle, or a portion must be filtered: it is very important not to let any excess of iodide of iron exist, as it would color the liquors by its conversion into iodurette iodide, and would render them turbid by the ochrey deposit to which it gives rise during evaporation. It is to avoid the inconveniences of this excess of iodide of iron that the alkaline solution is used for effecting the decomposition; it is, however, very rarely that we can obtain an iodide free from oxide of iron, and whose crystals may immediately be made use of. M. Guibourt's recommendation to boil the solutions for a long time on the precipitate in order to effect the peroxidation of iron, renders the process excessively slow, without conducing to good results: the only advantages it presents are the modification of the state of the precipitate and the more ready filtration of the liquors. The preparation of the iodide of potassium by iodide of iron therefore requires minute details which render the process of caustic liquors preferable. I should add that nothing can be done with the oxide of iron which is deposited; it retains in the state of insoluble combination an oxido-iodurct which is not destroyed by repeated calcination, even when moistened with oil or acetic acid.

If zinc be substituted for iron, the following differences present themselves:—

Zinc is dearer than iron; but the hydro-carbonate of zinc which may be obtained from it, may be made use of in the preparation of pure and white oxide of zinc. The iodide of zinc is more slow of production than that of iron, but the operation is effected in a few days, without the aid of heat, or at a gentle temperature, when the zinc is properly divided. The iodide of zinc is alterable in the air when it is dry, but very slightly so when in the state of solution, and the little tendency of zinc to peroxidise explains this difference. The lead, copper, iron, silica, and the traces of manganese which some of the varieties of zinc contain are not of any importance; the lead and copper are either not attacked, or form insoluble iodides; iron, if an excess of zinc be retained, remains in the deposit; not a trace passing into the liquors, and it is for this reason that the calcined hydro-carbonate gives a perfectly white oxide; the silica is not attacked.

The following is the modus operandi to which we had recourse:—

Finely divided zinc was treated by iodine and water in close vessels; it was stirred, and the iodine gradually and successively added, but in such a manner as always to leave an excess of zinc; the liquors were filtered, and the deposit washed in boiling water; the

washing water was cool before being added to the first liquor.

Having the solntion of iodide of zinc, a boiling solution of carbonate of potassa was poured in, and maintained at the boiling point: after every new affusion of iodide, and after an instant of trial, the deposit at first formed at the bottom was brought to the surface by the disengagement of carbonic acid gas which is separated from it, so that when, after the addition of a little of the solution, no disengagement of gas is perceptible, nor any precipitate swimming at the top, it may be presumed that the saturation is complete, and even in excess. The precipitate occupying the bottom, by the addition of a little cold water, the boiling is stopped for an instant; the liquor being cleared, it is easy to pour into it some solution of carbonate, of which a portion had been set aside for this purpose; an excess of this solution is added, which does not react on the precipitate, so that the solutions of iodide of potassium may contain no zinc. If by misfortune an excess of iodide of zinc had been left in, we should have iodide of zinc in the solution; but during the evaporation, and especially during that of the supernatant liquors, it would be decomposed, and would give a white precipitate which might be separated by filtration. The solutions are then filtered, and this operation is performed with facility; then the deposit, treated by being twice boiled in water, does not retain any more alkaline iodide: the washing waters are evaporated in a suitable manner. As to the hydro-carbonate of zinc, it contains a small quantity of insoluble iodurette of zinc; but submitted to a red heat, it loses that iodide, for the most delicate tests do not denote its presence after calcination.

IODIDE OF LEAD.

Only one iodide of lead is generally admitted; many facts, however, tend to shew that there exists another, containing more iodine; however, supposing there be but one, we shall now devote ourselves to the phenomena presented by its preparation. According to the Pharmacopœia, this iodide is prepared by the double decomposition of iodide of potassium and neutral acetate of lead, both pure; but it is important to see what may be the consequences of the employment of an iodide presenting the alterations whose existence we have just proved. It sometimes happens that acetate of lead, said to be neutral, is not perfectly so: the deposit of carbonate which remains undissolved from the time of its treatment indicates that it has undergone some alteration, and a very delicate way of verifying it consists in blowing into the solution, by means of a tube, the air expired from the lungs, which contains carbonic acid, and which immediately renders the solution of the basic acetate of lead turbid, and does not impair the transparency of the solution of neutral acetate. When it is proved that an acetate is basic, the employment of this salt causing the formation of an iodide with a mixture of oxide, oxido-iodide (Denot), should its use be rejected until brought to the neutral state by adding to its solution sufficient dilute acetic acid or distilled vinegar? The following is what experiment has taught us in this respect:—

If into a solution of subacetate of lead a solution of iodide of potassium must be poured until no more precipitate is formed, a precipitate of dirty greenish white oxido-iodide is obtained, which, put in contact with water acidulated by acetic acid, allows all its oxide to be dissolved, and acquires the beautiful yellow color which characterises iodide of lead. It is then easy to re-establish a straw-colored iodide mixed with oxide.

With the view of neutralising a solution of basic acetate of lead, dilute acetate acid is added to it; if an excess of acid were added, when the solution of iodide of potassium is poured in, the excess of acid would liberate some of the iodine, and we should have an iodurette of lead. It will be the same if, employing alkaline iodide of potassium, and even very alkaline, in order to prevent the free alkali from precipitating the oxide of lead, we put acetic acid into the solution of acetate, for the acid, as soon as it is in contact with the alkaline iodide, will liberate iodine, and we shall have a greenish or deep blue iodurette of lead, which will retain the excess of iodine so energetically as not to part with it by simple nor by alcoholic washings, nor even by contact with a caustic solution of potassa or soda. If iodide of potassium, containing carbonate of potassa were employed, the iodide of lead might be deprived of the carbonate of lead precipitated by it as I have said above; but if the iodide of potassa contained iodate, the iodate of lead would remain in the iodide of that metal, and could not be removed from it. A simple and advantageous process, inasmuch as it dispenses with the use of iodide of potassa, consists in decomposing iodide of iron prepared on purpose, by a solution of acetate of lead. It is true that the iodide of lead, however rapidly the decomposition may have been effected, remains mixed with iron, and detains it, unless very promptly removed by repeated washings; but this oxide is almost completely removed by a few washings with water acidulated by acetic acid, and the iodide remains pure and of most beautiful color. I have nsed this process very successfully at the *Pharmacie Centrale*, according to M. Soubeiran's recommendation.

ON GUAIACIC ACID, AND ON EXTRACT OF GUAIACUM.*

BY M. THIERRY.

When I undertook to make some experiments on guaiacum, I thought less of the acid which forms the subject of this notice than of the aromatic principle developed when the guaiacum is concentrated in order to extract it. However, the resemblance which exists between the odour of this extract and that of benzoic acid, gave me the idea that in guaiacum there might exist an acid analogous to benzoic acid. Always pursuing my first idea, and after many fruitless attempts, I treated extract of guaiacum—prepared according to the *Pharmacopœia* — with sulphuric ether, several times, without the aid of heat. The ether being evaporated in a porcelain capsule, yielded a residue of the consistence of honey, with a very agreeable odor similar to that of vanilla. It somewhat resembled recent balsam of Tolu. From this kind of resin, for the first time I obtained guaiacic acid. For that purpose, it is sufficient to put a small quantity of ethereal extract of guaiacum into a porcelain capsule, to cover this capsule with a sheet of blotting paper, pasted on the edges as in Mohr's apparatus for preparing benzoic acid, and to place over the capsule a glass funnel which is fastened to it by means of a strip of paper pasted. This small apparatus is put on a furnace, after having adapted to the furnace a slate perforated with a round hole—an arrangement by which the heat is kept at the bottom of the capsule, and not too much at the upper part of the apparatus. Thus arranged, it is cautiously heated, and that with only a few red hot coals. After a few minutes, the matter swells up, and white vapours are disengaged, and are deposited on the sides of the funnel as well as on the surface of the blotting paper, under the form of small brilliant needles. If it be rather too strongly heated, a brown oil is volatilised and colors the crystals.

But in this operation only a very small quantity of acid is obtained, and from other experiments I have found the resin of guaiacum answer the purpose best.

PROCESS FOR OBTAINING GUAIACIC ACID.

One pound of fine resin of guaiacum of commerce is taken, powdered and treated by alcohol at 56 C. in sufficient quantity to dissolve it entirely: this tincture must afterwards be filtered, distilled in an alembic placed in a sand-bath, to obtain three-fourths of the alcohol used. The operation terminated, there remains in the vessel a yellowish liquor which floats on the surface of the resin: it is allowed to cool, and is filtered. This liquor is acid; it is saturated with baryta water, which forms with it a soluble salt; this liquid is evaporated in the sand-bath until reduced to one-half, and this guaiacate is decomposed by dilute sulphuric acid which is added until no more precipitate is formed. In this operation, care is necessary: it is better that a small quantity of salt should remain undecomposed, than that there should be an excess of sulphuric acid, since the latter, when the solution of guaiacic acid is being concentrated, reacts on it and decomposes it. However, if too much acid be put in, a few drops of baryta water may be added. The liquor is filtered to separate the sulphate of baryta, and it is evaporated in the sand-bath until it acquires a syrupy consistence. This extract is put into a mattrass, sulphuric ether is poured on it, and it is left for some time in contact, taking care to stir it often; the ether dissolves the acid of the guaiacum, and does not attack the extractive matter; the liquor is poured into a capsule, the ether is allowed to evaporate, and the guaiacic acid is deposited on the sides of the vessel, under the form of very irregular flocks. This acid, thus obtained, is not in a state of purity; it retains a little resinous matter, and, in order to purify it, it must be sublimed by the process which I have described above. But to succeed well in this operation only small quantities must be operated on, and it is obtained in fine needles.

The acid of guaiacum is soluble in ether, alcohol, and water.

This acid differs from benzoic and cynnamic acids, inasmuch as the latter are but sparingly soluble in water, while guaiacic acid is perfectly soluble in that liquid.

The action of this acid on certain salts is still more dissimilar from that of these two acids. Time has not yet permitted me to terminate the series of experiments which I intend to make and to publish, accompanied by the organic analysis of this acid.

M. Righini (*Journal de Chimie Medicale*, 1836,) gave a notice concerning guaiacic acid. He distilled a tincture of guaiacum wood, separated the residue of the distillation from its resin, made a paste with the decanted liquid and pure magnesia, and introduced it into a glass retort: "There results from it," says he, "by distillation, an aromatic and limpid liquid. By dissolving the *caput mortuum* in pure water, and by decomposing it with dilute sulphuric acid, sulphate of magnesia is formed, and a white substance is deposited, which, dissolved in water and evaporated, forms an acid body crystallizing in needles." I have twice carefully repeated M. Righini's experiment, and I obtained, as a product of distillation, an empyreumatic, ammoniacal liquor, reddening turnsole paper. The *caput mortuum*, treated as he directs, yielded a very light flocculent precipitate, which, when filtered and applied to paper, gave it the appearance of being varnished. But this was not guaiacic acid; it was a resinous matter, which, saponi-

* *Journal de Pharmacie*, July 1841.

fied by the magnesia, was precipitated when no longer held in solution by that alkali. Guaiacic acid, being very soluble in water, could not be precipitated, as is the case in the preparation of benzoic acid by lime. Thus the acid of guaiacum does not crystallize in needles in these different solvents.

If, in this process, instead of employing pure magnesia, the liquid remaining in the sand-bath had been saturated with baryta-water, the same results as mine would have been obtained; but it is necessary to act on a large quantity of guaiacum, and to employ much alcohol.

EXTRACT OF GUAIACUM.

Pharmacologists are not agreed concerning the preparation of extract of guaiacum: some demand that the deposit which is formed in the decoction, on cooling, should be separated; others, on the contrary, are of opinion that it should be left in. The different experiments which I have made to obtain guaiacic acid from extract of guaiacum have led me to prepare this extract in three different manners:—

1st, According to the formula of the *Pharmacopœia*, and with the addition of alcohol at the end of the evaporation.

2d, By long boiling, and by separating the deposit.

3d, By macerating guaiacum for a long time, without heat.

The first of these extracts has a powerful smell, the second less, and the third no smell.

The first extract contains more acid than the second, and the third none.

If, as is very probable, the extract of guaiacum owes its properties to a peculiar balsamic resin, and to the acid contained in it, the formula of the pharmacopœia should be preferred.

That which I call a balsamic resin is the ethereal extract of guaiacum obtained by treating extract of guaiacum by sulphuric ether. This extract, dissolved in alcohol at 50 C., and mixed with syrup, gives a liquid which has the taste and odor of vanilla.

Besides the balsamic resin, extract of guaiacum contains another resin, a black matter insoluble in alcohol and soluble in ammonia, salts of lime, and iron in very considerable quantity.

ON THE RESIN OF GUAIACUM.

LETTER FROM M. PELLETIER TO M. CAP.

Paris, June 2, 1841.

My dear Colleague,—

I have been informed that a notice concerning the resin of guaiacum has been sent for publication to the *Journal de Pharmacie*.* To the knowledge of many of my colleagues, I have been for some time engaged on a work on the same subject. I have already collected much materials, but it is not finished, and can only appear in an early number of the *Journal de Pharmacie*. However, not to lose entirely the merit of my researches, allow me to point out to you some of the results which I have obtained.

I first made the elementary analysis of guaiacum resin in translucid tears. The following is its composition:—

Carbon	71·000
Hydrogen	7·033
Oxygen	21·967

Guaiacum resin, even in transparent tears, cannot, however, be regarded as an immediate pure principle; it contains, in the proportion of about $\frac{1}{10}$, a resin insoluble in ammonia and a yellow colouring matter. There are several processes for obtaining *guaiacine*, namely, the peculiar principle of the resin of guaiacum. That which I found most successful consists in pouring into the tincture of guaiacum resin, an alcoholic solution of acetate of lead. This solution must be added, by degrees, the precipitates must be fractioned, and the last that are formed must be rejected. The precipitate must be well washed, first with water, and then with alcohol, and decomposed by a current of sulphuretted hydrogen; finally the guaiacine must be separated from the sulphuret of lead by means of alcohol.

Guaiacine may also be obtained by treating the tincture of guaiacum by hydrate of lime; a compound of lime and guaiacine is obtained, from which the latter substance may easily be separated.

Guaiacine possesses in the highest degree the property of turning blue in the air, under the influence of light—a property which was well studied, in guaiacum, by Dr. Wollaston and M. Biot. The effect of coloration is produced more quickly in aerated water than in water deprived of air; however, it also takes place, in this case, accompanied by a disengagement of hydrogen. Bodies having an affinity for oxygen, such as sulphurous acid, sulphuretted hydrogen, proto-sulphate of iron, and the proto-chloride of tin decolor guaiacum which has turned blue. Exposure to the air and light re-establishes the color.

Damp chlorine, or chlorine in solution in water, turns guaiacum blue; an excess of chlorine causes a green and then a yellow color. In the green and yellow states the guaiacine is altered; in the blue state, it is only oxygenised, and may be decolored by sulphuretted hydrogen, &c.

I have already made some combustions of pure guaiacine and of its compounds, in order to determine its elementary constitution; this part of my work is not yet completed. I still have some doubts as to its capacity of saturation, and, notwithstanding its property of

* See the foregoing article.—Eds. Chem.

combining with salifiable bases, I hesitate to regard it as an acid.

I might touch on many other points, but I will desist; this note having no other object than that of obtaining priority, by making it known that I have for some time been engaged in the examination of guaiacum.

Agiéez, &c.

J. Pelletier.

NEW INVESTIGATIONS CONCERNING INDIGO.*

BY M. A. LAURENT.

Indigo, submitted to the action of chromic or nitric acid, is converted into a new substance which I call *isatine*, whose composition may be represented by indigo, plus two atoms of oxygen.

The formula of indigo being

$$C^{32}\ H^{10}\ N^2\ O^2,$$

that of isatine is

$$C^{32}\ H^{10}\ N^2\ O^2,\ O^2.$$

Under the influence of alkalis, isatine is acidified, absorbing one atom of water, and gives rise to a new compound, isatinic acid, the formula of whose salts is

$$C^{32}\ H^{12}\ N^2\ O5.$$

Isatine, treated by ammonia, forms six or seven different bodies:—

1st. Isatinate of ammonia:

2nd. Imosatine, which is a grey crystalline matter, the composition of which is represented by isatine, one equivalent of whose oxygen is substituted by 1 equiv. of imide = Im (HN), that is to say, by the formula

$$C^{32}\ H^{10}\ N^2\ O^2\ O\ Im:$$

3rd. Imesatine, which is crystallised in fine yellow rectangular prisms, and whose composition may be represented by isatine, of which 2 equiv. of oxygen are replaced by 2 equiv. of imide

$$C^{32}\ H^{10}\ N^2\ O^2,\ Im^2.$$

Under the influence of potassa, it is converted into isatinic acid:

4th. Imasatic acid: this body which is of remarkable beauty, crystallises in rhomboïdal tables of a pure shining red. With bases it forms yellow salts. Its composition may be represented by one equiv. isatine, and half an equiv. of ammonia

$$C^{32},\ H^{10}\ N^2\ O^2,\ O^2 + H^3\ N.$$

But this body does not contain ammonia; it should rather be represented by imosatine acidified by one atom of water:

5th. Amazatine, which is a bright yellow powder, and whose composition may be represented by isatine, of which 1 equiv. of oxygen is replaced by 1 equiv. of amide Am = $H^4\ N^2$, $C^{32}\ H^{10}\ N^2\ O^2$, O Am:

6th. A matter crystallised in rhomboïdal bracteæ of a golden yellow, but which I have not yet analysed:

7th. Isame, whose composition is doubtful, $C^{32}\ H^{12}\ O^{21}\ O\ H^2$.

Isatine, submitted to the influence of chlorine, is converted into chlorisatinase (Erdmann's chlorisatine). According to my analysis, its composition must be represented by isatine, of which two atoms of hydrogen are substituted by two atoms of chlorine

$$C^{32}\ (H^8\ Cl^2)\ N^2\ O^2,\ O^2.$$

Chlorisatinase, treated by the alkalis, absorbs one atom of water, like isatine, and gives chlorisatinasic acid, whose formula in salts is

$$C^{32}\ (H^8\ Cl^2)\ N^2\ O2,\ O^2,\ H^2\ O.$$

The foregoing compound is mixed with chlorisatinase (Erdmann's bichlorisatine). Its composition is represented by isatine, of which four atoms of hydrogen have been substituted by four of chlorine

$$C^{32}\ (H^6\ Cl^4)\ N^2\ O^2,\ O^2.$$

Chlorisatinase, treated by ammonia, forms a body analogous to imesatine: it is yellow, and crystallised, and its formula is

$$C^{32}\ (H^8\ Cl^2)\ N^2\ O^2\ Im^2.$$

It is imesatine in which 1 equiv. of hydrogen is substituted by 1 equiv. of chlorine.

Isatine treated by bromine is converted into bromisatinese, (bibromisatine of Erdmann); according to my analysis, its formula should be

$$C^{32}\ (H^7\ Br^4)\ N^2\ O^2,\ O^2.$$

Bromisatinese, under the influence of potassa, absorbs one atom of water, and forms bromisatinesic acid whose formula in salts is

$$C^{32}\ (H^6\ Br^4)\ N^2\ O^2,\ O^2.$$

Bromisatinese put in contact with anhydrous ammonia loses one atom of water, and gives bromimesatinese, which may be represented by bromisatinese, of which 2 equiv. of oxygen are replaced by 2 equiv. of imide, or by

$$C^{32}\ (H^6\ Br^4)\ N^2\ O^2\ Im^2.$$

By digesting isatine with hydrosulphate of ammonia, a deposit of sulphur and a crystalline matter which I call *isathyde*, is formed. Its formula is that of isatine, plus 2 atoms of hydrogen. It is formed by virtue of the following reaction:—

$$C^{32}H^{10}N^2O^4 + H^2S = C^{32}H^{10}N^2O^4,\ H^2 + S.$$

Isathyde treated by potassa, is converted into isatinic acid, and into a new compound which I have not studied.

According to Erdmann, chlorisatine treated by hydro-sulphate of ammonia, gives rise to chlorisatide, whose formula is

$$C^{32}\ H^{10}\ Cl^2\ N^2\ O^3.$$

According to my analyses, it should be

$$C^{32}\ (H^8\ Cl^2)\ N^2\ O^4,\ H^2.$$

Isatine treated by sulphuretted hydrogen gives a deposit of sulphur, and a new compound which I call *sulphesathyde*, and whose composition is represented by the formula

$$C^{32}\ H^{10}\ N^2\ O^2,\ S^2,\ H^2.$$

The following equation explains its formation:

* *Comptes Rendus de l'Académie des Sciences:* No. 2, July 12, 1841.

$C^{32}\,H^{10}\,N^2\,O^2, O^2 + 3\,H^2\,S = C^{32}\,H^{10}\,N^2\,O^2, S^2, H^2 + H^4\,O^2 + S.$

It is isathyde of which two atoms of oxygen are replaced by two atoms of sulphur.

Sulphesathyde treated by potassa, gives rise to at least five different compounds.

1st. Sulphasathyde crystallises in white bracteæ; its formula is

$$C^{32}\,H^{10}\,N^2\,O^2, OS, H^2.$$

It is sulphesathyde, of which one atom of sulphur is substituted by one of oxygen:

2nd. Indine, which chrystallises in microscopic crystals of a most beautiful rose-carmine color. Its composition is

$$C^{32}\,H^{10}\,N^2\,O^2\,H^2;$$

it is sulphesathyde minus two atoms of sulphur. This compound is isomeric with reduced indigo:

3rd. Black prismatic crystals which are a rather unstable combination of indine and potassa:

4th. Hydrindine crystallized in small colorless prisms, and whose composition may be represented by indine plus half an equivalent of water, that is to say, by

$$C^{32}\,H^{10}\,N^2\,O^2\,\dot{H}^2\,HO^{\frac{1}{2}}.$$

The elements of this half equivalent of water, are not in the state of water in hydrindine: however, this substance is converted into indine, at a high temperature.

5th. Long silky needles which are easily destroyed, and which are a compound of potassa and hydrindine.

Indine, treated by bromine, gives rise to a violet colored pulverulent compound, which appears to be the bromindine of Erdmann,

$$C^{32}\,(H^6\,Br^2)\,N^2\,O^2, H^2.$$

By boiling indine, or hydrindine, with nitric acid, a very beautiful purple-violet-colored pulverulent matter is formed: I call it *nitrindine*. Its composition is represented by this formula:—

$$(X = N^2\,O^4)\ldots C^{32}\,(H^6\,OX)\,N^2\,O^2, H^2_m.$$

It is indine, of which 2 equiv. of hydrogen have been substituted by 1 equiv. of nitric acid, or rather, by 1 equiv. of hyponitric acid and 1 equiv. of oxygen.

ON THE PRODUCTS OF THE OXIDATION OF GELATINE.*

BY M. J. PERSOZ.

In the course of my investigations concerning the molecular constitution and the classification of organic substances, I have observed a fact which I think should now be submitted to the consideration of chemists and physiologists.

Gelatine, a neutral, nitrogenous substance, submitted to an oxidising influence, is susceptible of being converted into hydrocyanic acid, ammonia, and carbonic acid. Besides these products, which are formed in considerable quantities, there is always produced a small quantity of one of the volatile, odorous, fatty acids whose existence was made known by M. Chevreul. The following are the circumstances under which this kind of oxidation takes place:—

40 grammes of gelatine dissolved in two quarts of warm water, acidulated by 300 grammes of sulphuric acid, were introduced into a tubulated retort, capable of containing about three quarts, and to which was adapted a receiver fitted with a tube for collecting the gases. This acid solution was cooled, and 160 grammes of bichromate of potassa were introduced into it, after which the retort was heated. A reaction speedily commenced; it was manifested by an abundant disengagement of carbonic acid, which was quite pure, as we ascertained by a great number of experiments. In proportion as this carbonic acid was disengaged, there was condensed in the receiver a liquid having a strong odor of bitter almonds, and at the surface of which a small quantity of oily matter was remarked.

In order to prove the presence of hydrocyanic acid in this liquid, obtained by distillation, we did not confine ourselves to the use of the ordinary reagents, such as nitrate of silver, the salts of iron with potassa, and the acids; but a portion was put in contact with well-ground oxide of mercury, after which it was filtered and evaporated in a suitable manner. When this liquor cooled, we obtained crystals of perfectly pure cyanuret of mercury, from which cyanogen was disengaged by distillation.

As to the residue left in the retort after distillation, it was concentrated in order to separate by crystallization the greater part of the alum of chrome, formed by the alteration of the chromate of potassa at the expense of the elements of the gelatine. The supernatant liquors, concentrated *de novo*, furnished colored crystals, which, washed with a little water, became colorless, and were easily recognised to be sulphate of ammonia.

This experiment, which we made for the first time in June 1840, has since been several times repeated; but we have never obtained any other products than those just mentioned.

There is no occasion here to dwell on the inferences to be drawn from the above experiment, as to the molecular arrangement of the elementary principles of gelatine. However, we think it should be remarked, that in not losing sight of the fact that chromic acid, by oxidizing the organic matters, determine the formation of products which are generally the same as those engendered by the same organic matters, when, under suitable circumstances, they are altered by the air or by oxygen, we are naturally to ascertain by analysis whether, among the products of the normal or abnormal secretions of the skin, some ammonia, hydrocyanic acid and its compounds are not formed, namely, the compounds of cyanogen and formic acid. A fact which took place about twelve

* *Comptes Rendus*, No. 3, July 19, 1841.

years ago would tend to make us think that in certain cases of suppuration, hydrocyanic acid may be formed. My friend, Dr. A. Nonat, then pupil at the *Hotel Dieu*, was in that capacity charged with the dressing of patients. One day he brought to me some lint and bandages stained of a blueish green, by their contact with the purulent matter of the wound of a patient. Might not this color be attributed to the prussian blue which may have been formed by the action of the pus on the iron mould, which may accidentally have existed on the linen and lint used for dressing the wound? It would be very easy to verify this by means of tissues impregnated with a ferruginous salt, which might then be used for dressing certain wounds.

M. Dumas remarked that in a case of the hands being burnt by concentrated potassa, he had observed this bluish suppuration for several days.

INVESTIGATIONS CONCERNING THE COMPOSITION OF ANTIMONIURETTED HYDROGEN.*

BY M. LASSAIGNE.

The discovery of antimoniuretted hydrogen by Thomson, in acquainting us with the existence of this gaseous compound, its principal properties and distinctive characters, and the circumstances in which it is produced, has, however, left us ignorant as to the proportions in which these two bodies are combined. With the view of supplying this deficiency we have tried some experiments on the subject, and have devoted ourselves to the study of this gas.

If the experiments which we have made have not yet enabled us to obtain this gas in a state of purity, but always mixed with a very large quantity of free hydrogen, we think that the method which we adopted for analysing this mixture, and for absorbing and decomposing the antimoniuretted hydrogen, should allow its true composition to be determined.

Indeed, it is known from the experiments of MM. Simon, Thomson, Vogel, and from our own, that the solution of nitrate of silver is decomposed at the ordinary temperature by antimoniuretted hydrogen; and that there results from this reaction a black precipitate of silver and antimony in the metallic state. We availed ourselves of the decomposing action of this salt for estimating the proportions in which these two metals are precipitated, and for deducing from their respective quantities the proportion of hydrogen previously combined with the antimony.

By combining antimony with zinc in certain proportions, a compound is produced, as the above chemists have announced, which is readily dissolved by weak sulphuric acid at the ordinary temperature, and which furnishes more or less antimoniuretted hydrogen. It is important, however, as we have ascertained, that the alloy should not contain an excess of antimony, for then it remains for the greater part insoluble, and consequently does not yield hydrogen. The different alloys which we made have proved that that which is best adapted for this preparation, and gives an uniform result, is composed of 12 parts, by weight, of zinc, and 8 parts of antimony. The other alloys formed in the proportions of 12 of zinc to 18 of antimony, or of 12 of zinc and 12 of antimony, are but very feebly attacked by weak sulphuric acid, and the action soon stops.

The gas which is obtained by dissolving the first alloy, that is to say, that in which the zinc and the antimony are nearly in the proportion of 3 atoms of the first, to 1 atom of the second, is formed for the greater part of hydrogen and of a small quantity of antimoniuretted hydrogen whose volume amounts to from 1½ to 2 per cent. We determined this small proportion in the direct way, by passing under water, in a graduated bell-glass filled with gas, a certain quantity of nitrate of silver; this salt being agitated produces an absorption of 2 per cent. in volume.

Repeated experiments made on the gas obtained with this alloy have always furnished us nearly the same result; and although we varied the temperature, we found it impossible to obtain antimoniuretted hydrogen gas without the admixture of a large quantity of hydrogen, which has prevented us from studying its properties in a state of purity.

In our examination we proved that this gaseous mixture of hydrogen and antimoniuretted hydrogen was characterised by a slight odor of rotten eggs, although it had no action on a solution of acetate of lead. Abandoned to the action of direct and diffused light, it gradually deposits on the sides of the vessel a light, blackish, brilliant layer of metallic antimony, and the volume of gas is scarcely altered, even at the end of several days. Heated over mercury, in a bent tube, it deposits at a little below red heat, a light, greyish powder of antimony, which attaches to the sides of the glass, and after this prolonged calcination the volume of the gas is not perceptibly altered.

In order to determine the proportion of the hydrogen to the antimony, we slowly passed all the gas which was disengaged from a solution of the alloy through a solution of pure nitrate of silver; the black precipitate, collected, washed, and dried, was treated by nitric acid, which dissolved the silver and converted the antimony into a whitish powder of insoluble antimonious acid: the weight of the latter compound allows the proportion of antimony to be calculated: as to the propor-

* *Journal de Chimie Medicale*, August 1841.

tion of hydrogen, we deduced it from the weight of the silver precipitated, and from the quantity of oxygen which it must abandon to the hydrogen of the gas in being precipitated.

In submitting the antimoniuretted hydrogen gas twice to this proof, we ascertained that its composition might be represented by the following numbers:—

Antimony	97·581
Hydrogen	2·419
	100·000

This decomposition deduced from experiment comes very near to that which theory indicates in the supposition in which this gas would be formed like arseniuretted hydrogen, of one atom of antimony and three atoms of hydrogen; in this case, the theoretical composition would be:—

Antimony	97·734, or 1 atom.
Hydrogen	2·266, or 3 atoms.

New experiments yet remain to be made for investigating the means of obtaining this gaseous compound pure and without admixture of hydrogen: we intend to try some. Perhaps pressure and a low temperature may be sufficient for effecting this separation? In that case it would be possible to study all the properties of this remarkable compound, which seems to resemble arseniuretted hydrogen in most of its properties and in its composition.

ON A NEW MODE OF FORMING VALERIANIC ACID.*

BY M. C. GERHARDT.

Since the beautiful investigations of MM. Dumas and Stass concerning the formation of valerianic acid by potatoe oil, this acid has acquired a certain importance in organic chemistry: its study has become as necessary as that of the most common bodies, but in order to study it successfully, a more expeditious and less costly process of preparing valerianic acid was necessary, the employment of potatoe oil not presenting every requisite convenience, notwithstanding the admirable clearness of the reaction. I now make known a kind of reaction which appears to me to present, in this respect, every thing required.

When caustic potassa is fused, and when we introduce into it, by small portions at a time, blue indigo, this body is dissolved in it, and is decolored, giving rise to an abundant disengagement of hydrogen and ammoniacal gases. The alkaline residue is a mixture of valerianate and carbonate of potassa. When it is gently heated with sulphuric acid, large quantities of valerianic acid may be obtained. By this simple process I have prepared in less than one hour considerable masses.

The reaction is very clear; it is effected at the expence of the water. The carbon of the indigo is divided in two; it remains fixed in the state of valerianic and carbonic acid; all the nitrogen of the indigo is disengaged in the state of ammonia, and the excess of hydrogen of the water which yields the oxygen necessary for the production of the two acids, is also liberated:

$$C^{32}\,H^{10}\,N^{2}\,O^{2} + 14\,H^{2}\,O = C^{20}\,H^{20}\,O^{4} + 6\,C^{2}\,O^{2} + N^{2}\,H^{6} + 6\,H^{2}.$$

As soon as circumstances permit, I shall have the honor of communicating to the Academy, the analytical data relative to this interesting reaction.

* *Comptes Rendus*, No. 5, August 2, 1841.

REVIEWS.

Lectures on Chemistry, including its application in the Arts.—By Henry M. Noad.—Nos. II. and III. London, R. Hastings, 13, Carey Street; Scott, Webster, and Geary, Charter House Square.

The second and third Nos. of this work, fully confirm us in the opinion we gave of the first Number.

No. II. is occupied with the subject of Heat, which also extends to No. III; in the latter, however, a popular view of "Chemical Affinity, and the Theory of Definite Proportions" is commenced.

We recommend those of our readers who are novices in the beautiful science of chemistry, to purchase each number of this work as it appears, and to read it during the month: they will thus, at the end of a few months, unexpectedly find themselves possessed of very considerable chemical knowledge.

A Table of Analytical Chemistry.—Arranged for the use of the practical classes in the Pestalozzian Institution, Worksop. By James Haywood. Worksop; F. Sissons: London, Longman and Co; and Taylor and Walton, Upper Gower Street.

Of this table, we need say no more than that it is likely to prove of great utility to the young chemist, who stands very much in need of such a valuable assistant.

II. CHEMICAL MANUFACTURES.

MANUFACTURE OF COPPERAS.

To the Editors of The Chemist.

Elland, near Halifax, August 9, 1841.

Gentlemen:—

In consequence of the attention which my last letter received from you, I have determined to furnish your journal with a short article on copperas-making. This is a more purely chemical manufacture, and since there are many circumstances connected with it which are not generally known, I trust it will

prove acceptable to your numerous readers. I am of opinion that if certain parties were to furnish you with papers of this description, we should shortly be put in possession of a more correct history of science and manufactures than has ever yet been offered to the public.

The prevalence of extensive strata of coal in the parish of Halifax will, probably, in some degree, account for the numerous manufactures of copperas which are here carried on, inasmuch as the iron pyrites, which forms the beds of these establishments, is usually mixed along with the coal. Yet, however correct this assumption may originally have been, it does not hold good at present; for the dross which is extracted from the coal formations is not sufficiently abundant to supply the beds in question, and consequently it is usually brought from other neighborhoods.

Whilst there were fewer copperas-works, no doubt the pyrites were the product of the adjoining collieries, but when the former became more numerous, then the materials for supplying them were procured elsewhere.

That, however, iron exists in tolerable quantity in the strata of this parish is abundantly proved by the ochreous deposit let fall by the several streams. This deposit of peroxide of iron would seem to be brought from the coal-beds, or from the iron-stone usually found beneath the coal, and may be taken up by the water either as a sulphate or as a carbonate. Each of these, on being subjected to the action of the atmosphere, is converted into the peroxide already alluded to. That both suppositions have some foundation in truth, is shown by the presence of very slight quantities of free sulphuric acid, which I have occasionally detected in some of the waters of this parish, particularly in the vicinity of Elland, and also by the facility with which the sulphuret is converted into the sulphate by the aid of air and moisture, and by the fact, that the carbonate of iron, though rarely found native here, can scarcely be otherwise than formed in those situations where carbonic acid so often manifests itself. Choke-damp and fire-damp are very prevalent in the collieries of this parish.

Having thus pointed out the inducements which have ever been offered to speculators in the copperas trade to institute manufactures here, I must now show from what other sources the pyrites is obtained, which goes to constitute the various beds. The deficiency is usually made up by purchases from other parts, particularly from the neighbourhoods of Leeds, Wakefield, Dewsbury, and Huddersfield, where the coal formations are more remarkable, and the demand for it greater, and where, consequently, a large quantity of pyrites is yielded. Whilst the coal strata in the parish of Halifax rarely exceeds twenty or thirty inches in thickness, those in the places just mentioned, reach upwards of four feet. The former are found in two distinct beds, styled the *hard* and *soft*, about thirty yards asunder, the first, or hard bed, lying most superficial, and containing all the pyrites.

But it is not from the coal strata alone that bi-sulphuret of iron is obtained: it sometimes occurs in rounded nodules having a radiated structure, divergent from a common centre in the beds of clay which are so common in Yorkshire. These nodules vary in size, from that of a bomb to that of a large cannon ball. When extracted from the coal, or clay, they are either round or in cubes, or in some form nearly allied to the latter. They vary much in color, being yellow or white, possessing a high metallic lustre resembling gold or silver. Their sp. gr. usually agrees with that assigned to them in books, being nearly 5.000. Should it be higher, we may take it for granted that they are not free from admixture, and when such is the case, I have frequently found the foreign material to consist of galena. Sulphuret of lead is a rare mineral product of this parish, nevertheless when it does occur, it is generally in a state of great purity. I have several large specimens in my collection at present, which, from their sensible and chemical qualities, approach as nearly to purity as any galena I ever beheld. The sp. gr. of some of it, is about 7·5. Galena is not only found in the pyrites, but it also occurs in seams adjoining the coal.

A seam of this sort was recently discovered in one of the collieries near Elland, from which a tolerable quantity of sulphuret of lead was extracted.

In the parish of Halifax there are several extensive copperas manufactories, three or four of which are in the township of Elland. Each of these is capable of making upwards of 120 tons of sulphate of iron, annually. With one or two exceptions, the beds connected with them are pretty nearly equal in value, being about forty yards long, and thirty broad. The employers, as I have before stated, are in the habit of importing the pyrites from neighbouring collieries, and the formation and quantity of copperas is assisted and increased by scraps of old iron, which they purchase from any suitable source.

Occasionally in fine weather, and when the bed is in proper condition, a large proportion of the pyrites is sprinkled over with a white powder, which rests upon the dross like hoar-frost. This appears to be sulphate of iron apparently deprived of its water of crystallization. In time this salt no doubt would become converted into the peroxide, but so soon as the first shower descends, it is washed into the cellar and vats, where it is no longer subjected to the action of the atmosphere. The rain which falls on the pyritic beds, assisted by the air, tends to decompose the bi-sulphuret, and to form new compounds, viz. cop-

peras or sulphate of iron, and free sulphuric acid. The sulphate of the protoxide of iron thus formed, is dissolved by the superabundant water, and this solution, together with the free diluted oil of vitriol, gradually drains from the bed into a sort of channel or gutter, which conveys it into cellars. At some works, instead of a gutter, the bed rests immediately over the arches of the cellar, each side sloping internally, and thus forming a species of trough with its bottom resting upon the roof, through which the liquor is suffered to drain. To prevent unnecessary loss of fluid, the parts external to the sides of the bed, are puddled. Having been filtered into the cellars, the fluid, which is very acid, remains there along with scraps of iron, until wanted, when it is pumped into large leaden pans capable of containing more than 1600 gallons. In these vessels it is boiled along with scraps of iron for upwards of a fortnight, this space varying however according to the strength of the liquor, and as the evaporation proceeds, additional fluid is pumped into the pan. This operation is continued uutil the liquid becomes of the requisite sp. gr. which the manager ascertains by weighing a certain bulk of it, as a pint, at which period the free sulphuric acid has united with a sufficiency of protoxide of iron, and the water is fully saturated with the sulphate. When ready to crystallize, one pint of the liquor weighs about 30 ounces.

In place of weighing, some makers set a portion aside in a basin, and according to the amount of salt deposited, decide whether the saturation is complete. The solution is then drawn off into leaden cisterns, and allowed to cool, when large crystals of sulphate of iron are deposited. The formation of these crystals is materially assisted by suspending in the liquor long poles or pieces of rope, to which the salt attaches itself in the shape of elegant oblique prismatic crystals of a beautiful light green color. After the crystallization is completed, the mother liquor is withdrawn, when the metallic salt covering the poles, ropes, &c. is allowed to dry. It is afterwards separated from its attachment by means of a hammer, and placed in a dry chamber, when it is ready for the market. The value of copperas is very trifling, though when the woollen and other trades are flourishing, there is a tolerable demand for it amongst dyers, &c. It is sold at from three to five pounds per ton.

At some establishments, in place of leaden boilers, they have cisterns built of brick work so closely cemented as to hold the liquid. This brick work is puddled externally. Cisterns thus contrived, are about forty-five inches wide, thirty inches deep, and sometimes more than twenty yards long, and calculated to hold an immense quantity of copperas-water. They are open at the top. At one end, somewhat below the level of the cistern, is placed a large fire of coals or cinders, the heat of which passes immediately over the surface of the liquor, and then escapes up a long chimney which rises from the other extremity of the cistern. The tall chimney is to promote a better draught.

The manufacture of copperas, however, is not always so easy as might be supposed, from the manner in which it has been described, and such is particularly the case in this part of the country, where many of the beds are in a poor condition from the want of being replenished with pyrites.

I will now make a few observations on the source of the failures, and how skilfully these have been obviated by the makers of copperas. In doing so, however, I shall be necessitated to extend this article somewhat beyond the limits which I had prescribed to myself at its commencement. Nevertheless, the importance attached to this division of the subject will furnish a sufficient apology.

The first source of error that comes before us is the poor condition of the beds. These, which in some cases have not been renewed for half a century, and which, either the cupidity or inability of the owner, has submitted to a continual course of exhaustion during the whole of that time, are now become incapable of yielding a sufficiency of acid to dissolve the iron, or to protect it from oxidation in the boiling. I have seen several instances of want of success from this cause, where the liquor, when it ought to have yielded a large crop of the sulphate, deposited a pan half full of peroxide of iron, marked here and there with small spicula of the proper salt. In the production of this oxide, two or three causes may have been in operation, such as impurity of the water, or deficiency of acid, or both. It must be remembered that none but rain-water can be employed with safety, for in the vicinity of these works, the spring and running water is itself so charged with peroxide of iron or ochre, &c. that if allowed to flow upon the beds, or into the cellars, it invariably carries a large portion of this powder, &c. along with it, which, after the evaporation is completed, remains unacted upon either at the bottom of the pan or mingled with the crystals. It would seem that a superabundance of acid alone will dissolve some portion of this sediment. Again, the free oxygen present in the spring water may convert some of the iron into peroxide; and what is worthy of greater attention, rain water circulates and filters through the bed more gradually and completely than water from other sources, operating effectually in the decomposition of the dross, and also uniting with a larger share of copperas and oil of vitriol when formed.

The greatest injury, however, arises to the manufacturer when his acid is deficient in quantity, for the longer the boiling is continued, so long and the more peroxide will be

precipitated. This may be explained in two ways, either by supposing that the acid is in some measure decomposed, or that it is insufficient to protect the iron from the action of the atmosphere, thus in both cases allowing of the deposition of peroxide. Again, the acid will dissolve only its proper equivalent of iron.

I believe both causes are here in operation. During the boiling, acid vapours, &c. are evolved.

The copperas manufacturer, after suffering considerably from mishaps of this kind, has at length hit upon a method of remedying the evil. In those instances where circumstances will not admit of his renewing the beds, he is in the habit of adding sulphuric acid, to the amount of some gallons to his liquor, either whilst in the cellar or in the pan. This has the desired effect, and instead of the peroxide which previously annoyed him, he obtains crystals of the requisite quantity and shape. This custom is not generally known, and the makers usually keep it secret, since it would injure their establishment in the opinion of those with whom they deal, because it is supposed that oil of vitriol, thus used, renders the copperas less suitable for dyeing cloth. Why such should happen, I will not pretend to explain. Be it as it may, it would appear that the natural way of making copperas, if the expression may be allowed, is vastly preferable to the artificial. The sort of salt preferred by dyers, varies according to the color sought. Thus where light colors are made, the fine green copperas is requisite; for darker shades, the brown sulphate, which is a mixture of the sulphate of the protoxide with the sulphate of the peroxide. Such might have been inferred from their different chemical properties on solutions of ferrocyanuret of potassium, the sulphate of the protoxide yielding with this agent a white precipitate, and the sulphate of the peroxide, prussian blue. With the brown sulphate, gall-nuts form a deep blue ink. Dyers were a long time in discovering the nature and source of these qualities of copperas. They have, however, now become perfectly familiar with them, and the means which the makers adopt in order to supply their various wants, are very simple. The green consists of the first and best crop of crystals, whilst the brown is formed in the course of a more protracted crystallization of the divided salt, and during the time of its exposure to air in the chambers. After each boiling, a layer of dirt, about six inches deep, mixed with much peroxide of iron, remained at the bottom of the pan. This has to be removed prior to a second operation.

Before concluding my letter, it will be advisable to make a few observations on the methods of applying heat to the pans and cisterns during the evaporation. These vary with the establishment. The original plan, and that, too, followed at some of the oldest, is by means of grates and flues placed under the pan. This method, however, is now becoming obsolete, in consequence of its destructiveness to the boilers, and the great demand for fuel. Added to this, much heat is needlessly consumed, not only by passing up the chimney, but in raising the temperature of a larger quantity of liquid than is necessary. Such manufacturers as are dissatisfied with this process, convey heated air from fires placed at one end of the pan directly over the surface of the liquor, a rapid current being established by the aid of a long chimney rising from the other extremity. This practice has the advantage of keeping up a sufficient evaporation with less expense of fuel, and also of merely heating the surface instead of the whole body of fluid. Again, the pan itself, should it be of metal, is not subjected to a temperature so injurious to the material of which it is formed, viz. lead, nor is the liquor or copperas so liable to be decomposed. A third plan of evaporating has been proposed, and in some places put in effect. This is by making steam or heated air circulate through the liquid by means of a coil of leaden piping. The principle on which it is accomplished is excellent, though not so generally adopted as it will be in time to come.

In conclusion, I may observe that the fumes arising from these manufactures, are somewhat disagreeable, and of course not only accompanied with the evolution of hydrogen, but also of sulphuretted and carburetted hydrogen and sulphurous acid gases. Hence we would look upon them as rather prejudicial to health, if not to animal life. Such, however, is not the result here as regards man, for it is worthy of remark that some of the oldest and most healthy individuals with whom I am acquainted, are those who have been connected with copperas-making during the greater part of their lives. I know one man who is above 80 years of age, and who at the present moment may be considered in robust health. He has, however, always been a most temperate and regular character, and this is true as regards most of the individuals who labor at these places. Neither does the vegetation in the vicinity suffer. The rose and the honeysuckle flourish as luxuriantly under the walls of a copperas-house as they are ever known to do in their native woods. The herbage of the adjoining meadows is equally healthy and abundant. All these facts may be accounted for by the supposition, that either the gases are carried away by the numerous currents, or are too largely diluted to produce their deleterious properties, and not by supposing them to be innocuous, for there cannot exist a doubt that sulphuretted hydrogen is one of the most poisonous compounds with which we are acquainted. Its effects on rats and horses are well known, and though the

latter do not seem to suffer much, yet rats and birds are frequently found dead in and about these establishments, with no other way of accounting for their destruction than by the effects of these gases upon them.

All the buildings and out-houses connected with copperas manufactures, are usually blackened, and as such assume a peculiar and somewhat uninviting aspect.

I am, Gentlemen,

Very respectfully yours,

JOHN S. HILEY, M. B.

ON THE MANUFACTURE OF SULPHURIC ACID FROM IRON PYRITES.

To the Editors of The Chemist.

GENTLEMEN :—

I have no doubt you will acquit me of presumption in taking the liberty of offering, for your consideration, a few remarks on the objections which you raise to sulphuric acid manufactured from iron pyrites, on account of the quantity of arsenic this ore contains, which appeared in THE CHEMIST, of July last.

In the first place, it would be well to inquire why this ore has been so extensively used of late as a substitute for sulphur. I believe the consumption was very insignificant indeed before the KING of SICILY granted a monopoly of the sulphur trade, to a Company of Frenchmen. When he had done this, as a natural consequence the article rapidly rose in price, and would have gone considerably higher had not the manufacturers made use of this substitute, and thereby diminished the consumption of sulphur. The iron ore being very abundant in this country, was speedily brought into use by the large sulphuric acid manufacturer, though not without much trouble and cost to themselves, and consequently checked the rise in the price of sulphur; and had the monopoly continued, no doubt they would eventually have found a supply equal to the demand of the trade. But then there is the objection of its containing so deleterious a substance as arsenic, which certainly appears at first sight a most formidable obstacle, on account of sulphuric acid being so extensively used in the manufacture of many articles employed in domestic and manufacturing operations: but in the article you mention—soda—it seems almost impossible that it could be found, when we consider the great heat to which the sulphate is subjected, along also with carbonaceous matter, in decomposing it for soda—a heat more than sufficient to dissipate the whole of the arsenic it may contain.

But that there are many articles manufactured by the aid of sulphuric acid, which must necessarily contain the poison, I by no means deny, as the contrary is notoriously the fact; but whether we should on this account abandon an article found abundantly at home, for one of foreign supply, where we are evidently subject to the caprice or cupidity of a poor dependent Sovereign, does not seem altogether so plain. Ought we not rather to endeavour, if possible to get rid, at a cheap rate, of the poisonous matter, and thereby preserve the advantages arising from a home supply of an article of such extensive use?

But how could this be accomplished? Much greater obstacles have been surmounted, otherwise our chemical operations could not have been brought to the perfection they have—imperfect as they yet may be. Suppose, however, some such method as this to be adopted: let the gas, instead of directly entering the chamber as it issues from the furnace, traverse a series of pipes passing along the side of the chamber, or if need be, all round before it enters it; would not the gas, by being so much cooled, deposit any arsenic which it might contain before it arrived at the chamber? and, would not the gas, by being reduced in temperature in this manner, the more readily condense into sulphuric acid, and thereby compensate for the loss sustained by the increased expenditure of erecting the leaden chambers? I am persuaded many plans might be adopted for this purpose, but have no doubt I have already wearied your patience, though I hope not to such an extent as may prevent my reverting to the subject at some future time, and shall subscribe myself for the present,

Respectfully yours,

A MANUFACTURING CHEMIST.

Gomersal, Aug. 10, 1841.

ADULTERATION OF MOIST SUGAR.

Caution to Poor Law Unions.

BY CHARLES WATT, JUN.

MY attention having been called to the adulteration of moist sugar, by the receipt of a sample of some which had been supplied to one of the Poor Law Unions, I lay before the readers of THE CHEMIST the result of the analysis which I have made, with the view of drawing public attention to an almost unparalleled instance of fraud, and one which I have reason to suspect is very extensively practised.

In former days, persons were content with mixing a little sand with moist sugar, which, although it was robbing the public, at any rate was a comparatively harmless adulteration, because, when the sugar was added to

the liquor to be sweetened, the sand fell to the bottom of the vessel, and was thus easily detected and the party avoided for the future. But now that people are more refined, and that roguery is almost scientifically practised, adulterations have become more heartless, more infamous, and more extensive, and, notwithstanding that our means of ascertaining them have very much improved, they are more difficult of detection.

It is disgraceful to see men endowed with intellectual faculties, intended for far loftier purposes, debasing themselves by trying for the sake of gain to make the lot of the poor more wretched than it already is. If such miscreants have the same treatment meted to them "with the same measure wherewith they have meted to others," how deplorable will be their lot!

The adulteration which is now more particularly under consideration, is that of some moist sugar which was supplied to a Poor Law Union at 76s. per cwt., which is a fair price for a genuine article, and which would have allowed the dealer a reasonable remuneration; but this worthy's cupidity would not allow him to be content with this: he must rob the poor pauper, who at the best of times does not receive too much of the luxuries of life. The wretch who could deprive this class of persons of any portion of what they have allowed them, is a creature whom language is not strong enough to denounce. He who robs a place of worship is a saint in comparison with such a miscreant.

The sugar in question was treated in the following manner: 200 grs. were put into a glass vessel, and cold water was added: the sugar was dissolved, and a white powder remained at the bottom. The supernatant liquor was then poured off, and the powder carefully washed, dried, and weighed. The white powder was then further examined, and proved to be *fecula*,* the weight of which amounted to about 8 per cent. From information which I have obtained on the subject, and from the appearance of the sugar, I am enabled to state that a substance known by the name of potato-meal, or potato-arrowroot, was the article used with which to adulterate the sugar, and as this substance contains only about one-third of its weight of fecula, it is clear that the adulteration must have been to the extent of nearly 25 per cent.

The quality of the sugar is very bad, and although I do not like to charge persons with an act of which I cannot be positive, yet it seems clear to me that there must have been a connivance between some of the parties in authority, or they never would have suffered the poor, under their charge, or the public who placed them there, to be so infamously defrauded.

I feel confident that it is only necessary to awaken the public, and some of the worthy gentlemen who have time to devote to the subject, and take an interest in seeing that the poor are properly taken care of, to the fact that many of the articles supplied to the Unions on contract are scandalously adulterated, for them to devise and adopt some plan to stop such villany, and to secure to the guilty the punishment they so richly deserve.

I cannot conclude without expressing my sincere acknowledgments to those who have so kindly afforded me the information which has enabled me to give publicity to this adulteration, and who have so warmly taken up the subject at the Union in question.

* Fecula is soluble in hot water, but insoluble in cold.

CARSTAIRS' WRITING INK.

We have received a bottle of this ink from Mr. Barton, the proprietor, and cheerfully add our testimony to the numerous others in its favor. We do not recollect ever having used better.

III. PHARMACY, &c.

MEDICAL REFORM.

That the present state of medical education, government, and practice, can no longer be suffered to disgrace the name of science in this country, and that society cannot longer be left unprotected against ignorance, folly, and imposition, nor the educated and enlightened practitioner be cheated of his just rights, and permitted to remain on the same degraded level with the illiterate pretender and fraudulent empyric, must be evident to all who are conversant with the subject, or possessed of common reflection.

The time has now arrived when changes must and will take place: the question therefore rests entirely on the nature of these changes, and the extent to which they are to be carried. During the present session of

parliament, great exertions will doubtless be employed to obtain certain objects in conformity with the notions of such as desire only to advance their own ends, to the injury of all the other classes of the profession and of society itself; nostrums of all kinds will be compounded and made palatable by being disguised in vehicles calculated to deceive the Legislature and induce it to gulp it at once. Exeter Hall will, we doubt not, again ring with Gallipot oratory, and the Solons of the "Association" will frame laws which will make Machiavelli "a dead letter," and the *Code Napoleon* a bye-word of ridicule.

The most unquestionable authority assures us that it is the intention of certain interested parties to use all their exertions and influence to obtain, by a new kind of tact, restrictive measures of Medical Reform, bearing very heavily upon Chemists and Druggists; and therefore, in conformity with our engagements with that body, we are induced to urge them to be vigilant, and to arouse their attention in time, and not to suffer themselves to be made the victims of tyranny, nor listlessly to succumb to the wishes of their enemies; and while we thus call upon them for activity, we assure them that in the hour of need we shall be at their right hand, and that our duty will be neither neglected, nor performed with indifference.

So often have we received the acknowledgments and thanks of that portion of our readers who are engaged in the department of Pharmacy, for the interest we have evinced on their behalf in our columns, that we deem it quite superfluous to make any further remarks on the subject of our being identified with the interests of their body; but we wish to be distinctly understood as confining ourselves solely to these without the slightest reference to, or connection with, any petty twaddlers who may be suddenly seized with a scribbling mania, from a penchant of all others the least suited to their capacity or knowledge. Our subscribers are aware that every number of this Journal, for twenty-one months, bears on the face of it the surest proofs of our priority, and indelible evidences of our strenuous, incessant, and successful labors in that cause, with the justice of which we have from the first been fully satisfied. In the settlement of all differences in the government of the medical profession, we have no fear that Chemists will not conform to any fair and equitable arrangements; but in the mean while, we cannot too strongly recommend them not to relax their efforts, nor to trust their concerns and interests to any societies which, toadstool like, may suddenly spring up. District meetings and petitions, in case of further attempts at encroachment, will do all, and that with tenfold effect.

Our observations from time to time upon the present disgraceful condition of the medical profession, and the still more culpable conduct of a set of men who assume the name of medical practitioners only to degrade it, never, it is obvious, have been directed against such as are qualified by education and science, whether these have been acquired at any recognized college or school, and are sanctioned by any diploma, or those who on the contrary have been self-tutored by the best of all instructors—personal application and industry. Such, to use the language of the late Dr. Geddes, we "should hail as a fellow disciple," even though a member of no chartered body. Let it, however, be understood, we do not intend that any but perfectly qualified persons should be permitted to have the care of health or the power to administer medicine. A graduated scale of education and examination, is all that we are desirous of having established in the respective grades of medical practitioners, commencing with physicians, and descending regularly to chemists and druggists; and that it be made compulsatory on all to qualify according to the rank he intends to take in the profession.

This plan of education and proof of competent knowledge on the part of dispensing chemists, in chemistry, botany, materia medica, and pharmacy, is what we have ever advised, from the firmest conviction of its great benefits to themselves and the required safety and confidence of the public. At present we complain of the deficient knowledge in all ranks, and particularly in that of apothecaries, in which there exists the grossest ignorance, presumption, and disqualification. It cannot, for an instant, be supposed we mean to shield chemists, while we advocate strict examination into the attainments of the other branches; on the contrary, we are satisfied that no one ought to be allowed to deal in medicine, unless he knows the properties and doses of the article he keeps, and the diseases in which they are given. We have a due respect for

the honor, liberality, and advancement of the profession, and these we are confident can never be established, until the ignorant and smattering pretender, and the fraudulent and infamous empyric are driven from its ranks and totally suppressed.

The laws which tolerate such, and particularly the latter, in order to augment the revenue, are a disgrace to the legislature and a civilized community.

Our readers may rest assured, that the interests of chemists and druggists are by no means at variance with the welfare of the other branches of the profession, and may feel satisfied, that while we are exerting our efforts to protect them from the aggressions of the middle ranks, it is perfectly compatible with our duty to conserve the respective interests of all.

Our pledge is with the body of the trade, and not with any societies whose proceedings for the most part, in this country, commence with talk, and terminate with feasting. Like Milton's academy in Aldersgate Street, at best "they produce nothing wonder-working." The trade must be its own protection in those rights which belong to them in common with every other class of tradesmen, and must be on the alert to persevere against the attempts of that portion, which, in order to live, is obliged to combine the trade of the Chemist with the semi-professional rank of the Apothecary.

To render the medical profession efficient, respectable, and entitled to public confidence, it becomes necessary that some measure should pass into a law, establishing a regulated system of medical government in education and practice. The privileges of rank ought to be thrown open to all, if, upon examination by a proper method of testing knowledge, and not by a set of boobies, like apoplectic compounders of lenitive electuary, they are found to possess such knowledge as qualifies them to practise, though they may be totally unconnected with any constituted college or school.

It is easy to shew the worthlessness of these. The College of Physicians, by far the most deserving of confidence, is a sad and powerless piece of machinery: the College of Surgeons, a perfect farce; and the Apothecaries Hall, a place of examination in every thing but medicine and its proper collateral subjects. The claim of societies in general to respect is by no means advanced by the last sittings at Plymouth of the British Association —"The Parliament of Science." If the "collective wisdom" of the high court of Parliament during the session, by its deliberations on the present condition of politics, does as little to relieve the nation, it will indeed deserve greater ridicule than "Mudfog," and draw down more serious consequences; but we have better hopes of this assembly.

In our next number it is our intention to lay before our readers a new and original form of medical education, government, and practice, which, while it will afford the public a complete protection against the dangers of ignorance, it will, at the same time, secure to the well educated and qualified practitioner the just reward of his labours in the acquisition of knowledge, and in the skilful discharge of the arduous duties of his profession.

MEETING OF CHEMISTS AT EXETER.

To the Editors of The Chemist.

Medical Hall, Exeter,
August 16, 1841.

Gentlemen:—

Agreeably with a resolution passed at a meeting of the Chemists and Druggists of Exeter, I beg to hand you a copy of proceedings, and to request the favour of insertion in your valuable magazine. By so doing you will oblige the committee.

I remain, Gentlemen,
Your obedient servant,
John Palk, Hon. Sec.

At a meeting of the Chemists and Druggists of Exeter, held at the Globe Hotel, Thursday, 3 o'clock, p.m. Aug. 12, 1841, Mr. Knott in the chair, it was

1st, Moved by Mr. John Palk, seconded by Mr. Hooker, and resolved—

That the thanks of this meeting be given to the committee of Chemists and Druggists of London for their zealous and successful exertions to defeat Mr. Hawes' Bill, which would have abridged our existing privileges, and injured us in the exercise of our business.

2nd, Moved by Mr. Evans, seconded by Mr. W. A. Tanner, and resolved—

That this meeting fully approves the establishment of the Pharmaceutical Society of Great Britain, and, believing it to be one of great importance, feels bound to promote its interest, and tenders its best thanks to the Council in London for their strenuous efforts in bringing this Society into operation.

3rd, Moved by Mr. Goodman, seconded by Mr. Parsons, and resolved—

That this meeting agree to enrol their

names as members of the Pharmaceutical Society, and that the Secretary be requested to wait upon the Chemists and Druggists of the City of Exeter with a recommendation from this Meeting to adopt the same measure.

4th, Moved by Mr. TRIX, seconded by Mr. VISICK, and resolved—

That the thanks of this Meeting be given to the Editors of "THE CHEMIST," who have so kindly come forward to advocate the cause and defend the rights of the trade, and that the Secretary be requested to send the proceedings of this Meeting for insertion in their next number, for the encouragement of others to come forward and join the Pharmaceutical Society.

5th, Moved by Mr. PALK, seconded by Mr. TANNER, and resolved—

That the following resolution be proposed for the adoption of those who contributed to the funds now in hand:—

"That the present balance be remitted to London, towards defraying expenses attending the late proceedings to defeat Mr. Hawes' Bill, and also to promote the objects of the Pharmaceutical Society lately established."

6th, Moved by Mr. H. EVANS, seconded by Mr. J. TRIX, and resolved—

That the thanks of this Meeting be given to Mr. KNOTT, for the efficient performance of his duties as Chairman.

COUNTRY DRUGGISTS AND THE PHARMACEUTICAL SOCIETY.

To the Editors of The Chemist.

Ashford, Aug. 13, 1841.

GENTLEMEN:—

As nearly every reader of your columns has something to say concerning this all-engrossing topic—Medical Reform, or the society which it has been the means of calling into existence, perhaps your humble servant may be permitted to make a few remarks *en passant*.

Although the advantages held out by the originators of the Pharmaceutical Society to induce the Druggists in the provinces to join it, may appear to them (the originators) very great, yet, it must be borne in mind, this same country Druggist is, generally speaking, a shrewd calculating sort of personage having a "pretty considerable spice" of the JOHN BULL hanging about him, which makes him always desirous of seeing his money invested in such a manner as to yield a tolerable annual per centage, and the very idea of transmitting two guineas every year to London, in all probability to be no more seen or felt in a tangible shape, is to him a serious piece of business; for, says he, this 2*l.* 2*s.* per annum is equivalent to the interest on 42*l.* placed out at 5 per cent.

From the enquiries I have instituted and the remarks I have heard made by numerous parties in the trade, it seems to be the general opinion, at least in these parts, that if the subscriptions were reduced just one half, i. e. to 1*l.* 1*s*, and 10*s.* 6*d.*, numbers would be induced to become members who will otherwise withhold their names.

The hardest part of the business, however, seems to rest upon the assistants and apprentices. They are politely told, "unless you send in your guinea before the first of July, 1842 (at least so I understand it, notwithstanding the late manifesto), you can never join our society without undergoing an examination, &c., and, in the event of our getting incorporated by Royal Charter, you can never commence business except you have previously been one of our associates!" Very fine all this:—the privileges to be enjoyed by associates may be well worthy the attention of those assistants and apprentices who reside in or near London: but pray, of what possible use will they be to those situated some one or two hundred miles from the "Great City?" They may, it is true, get an occasional peep at the museum, and hear a lecture or two should they be fortunate enough to pay an annual visit to town, otherwise I doubt very much if one in fifty will obtain any actual benefit from his outlay of one guinea per annum.

The foregoing observations embody, as nearly as possible, the train of reasoning into which I am sorry to say scores, aye hundreds, of the country Druggists and their Assistants have fallen, and which will in the end prove exceedingly detrimental to the interests of the Pharmaceutical Society, in the welfare of which I have from the first taken a lively interest, and with all of whose regulations I do heartily concur, save this, not on my own account, for I shall cheerfully contribute my mite towards the support of so excellent an institution, but I do think that the annual abstraction of one guinea from the already too scanty salary of Druggists' Assistants, would be severely felt by many who yet might contrive to lay by 10*s.* 6*d.* for so desirable a purpose.

In conclusion, sincerely I hope that the matter will be taken into consideration by the committee of management, and that this question will be seriously enquired into,—whether more money would not be obtained, (and this it appears is most wanted at the outset) by reducing the subscriptions one-half, than by keeping them up to the sum already proposed.

I am, Gentlemen,
Yours respectfully,
JOHN FORDRED.

PROCESS FOR PREPARING A PURE AND CONCENTRATED SOLUTION OF OPIUM, FREE FROM NARCOTINE.*

BY T. AND H. SMITH, CHEMISTS, EDINBURGH.

We are certainly not of the number of those who hold the artificial salts of the active principles of opium in slight estimation, but on the contrary, we feel that their discovery forms a most important and interesting event in the history of pharmaceutical science, and entitles the Chemists, to whom we are indebted for them, to the lasting gratitude of the profession. Nevertheless, as the natural combination of morphia as it exists in crude opium does, and in all probability will, continue to be preferred and used by a great proportion of medical men, it becomes a matter of great importance to obtain a preparation which shall be free from objectionable properties, and approach as nearly as possible to excellence. The following formula for a solution, we submit to the medical profession, by whose decision its title to such a character as the above, will and ought to be decided.

Macerate for twenty-four hours any quantity of opium in as much water as will be sufficient to cover it completely, and press the solution through a cloth; digest again for the same time in a like quantity of water; again press out, and repeat the process exactly in the same manner, till the opium has been exposed to the action of seven waters, when it will be sufficiently exhausted. The waters are then to be evaporated to the consistence of a soft extract, the concentration being finished over the water both to prevent the active principle being injured by too great a heat. Take up the soluble parts with repeated portions of water, filter, and again evaporate to a syrupy consistence. Expose the syrupy extract to the influence of ether, for the purpose of removing the narcotine; after the ether has become saturated, pour it off, and add fresh portions, till on evaporating a small quantity, no solid residuum is obtained. The extract now freed from narcotine is to be heated in a water bath to drive off the ether completely, and digested in alcohol till nothing soluble in that menstruum is left. A large quantity of inert matter will remain, which we have proved experimentally to be quite free from morphia. The alcohol must now be distilled off, and the residuum of distillation dissolved as completely as possible in cold distilled water; a farther portion of inactive pulverulent extractive matter will remain undissolved. The solution after filtration, is now to be set aside for two or three weeks, when a considerable quantity of solid matter will be found settled to the bottom, from which the liquid must be separated by filtration, and evaporated till about 12 oz. are left for every 4 oz. of opium used; filter, add $2\frac{3}{4}$ oz. of alcohol, and enough of distilled water to make 16 oz. The solution thus obtained, is of a much lighter color than laudanum, and much more fluid; it is also quite free from anything nauseous in taste or smell, the taste being only slightly and not unpleasantly bitter even in the undiluted state. It is also miscible without muddiness with water and spirituous liquors; but of course will be decomposed by all substances which act on the morphia salts, as it contains, if rightly prepared, the full quantity of that principle which an equivalent portion of crude opium would give. This we have proved by precipitating the morphia from the solution, and forming a muriate, when we obtained from a quantity equivalent to 4 oz. of opium, between 3 and 4 drachms of the salt, which was nearly white at the first crystallization, having only a slight fawn tinge, and was perfectly free from narcotine. One of us was as completely narcotized with 8 drops of the solution, as he would have been with about 80 drops of laudanum. Although the solution is so much freed from principles subject to decomposition, it will be found necessary to add the proportion of alcohol recommended, as it will not keep unless this addition be made; its surface, if it be allowed to stand for some weeks, beginning to exhibit some appearance of mould. The quantity of spirit added, however, forms so small a proportion, that the preparation may with perfect propriety be considered a watery solution of opium. An ordinary dose does not contain more than about 2 drops of alcohol, a quantity so minute that it is unnecessary to take it into account. We have also prepared a solution much more concentrated, by evaporating the liquid so far, that every 24 oz. shall contain the soluble narcotic principle of 16 oz. of opium; its dose is from 3 to 5 drops; its consistence is not much greater than that of laudanum, and it is transparent.

A good liquid preparation of opium should, we conceive, be characterized by the following features, and it has been our aim to make as near an approach to them as possible in the above solution. 1. It should not be subject to change or decomposition by keeping. 2. It should be as free as possible from substances inert or hurtful in their nature. 3. The menstruum should have no action in itself which can modify or obscure that of the narcotic. 4. The mode of preparation must not be productive of injury to the efficient principle of the opium. 5. It should be as free as possible from any nauseous taste or smell. 6. It should remain clear and transparent on mixing it with watery fluids; and, finally, be so concentrated as not to interfere with its portability—a point of no small importance, especially to country practitioners, and with a

* *Edinburgh Monthly Journal of Medical Science;* No. VIII., August, 1841.

medicine in such constant and prompt requisition as opium. The foregoing preparations are marked by all these characters, and we therefore consider them entitled to a place among the many other useful preparations of opium. A very fine watery extract of opium may be obtained by concentrating the pure watery solution at the heat of a water bath to the consistence of a pilular mass. A similar extract was prepared by Robiquet, but not quite so completely free from impurities. Two pounds of opium yield 12·33 oz. extract, so that a grain is equal in power to 2·59 grains crude opium, being about twice and a-half its strength.

ON CERTAIN ANTHELMINTICS IN USE IN ABYSSINIA.*

BY DR. AUBERT.

Dr. Aubert, who has resided some time in Abyssinia, states, that the whole medical practice of the natives consists in the employment of three indigenous vegetable anthelmintics, called Cusso, Bisenna, and Abbatsjogo; and that tænia is so common among the inhabitants as to be considered almost natural. Bruce remarked, that almost all Abyssinians were affected with ascarides; but as the Abyssinian word applies to either species, and Bruce was not a physician, it is probable he confounded the two, especially as the Cusso, which he praised as a remedy against these worms, Dr. Aubert finds to be used in tænia.

The Cusso is the *Banksia Abyssinica* of Bruce, the *Hagenia Anthelmintica* of Willdenow, one of the species of the genus *Saponaria* of Linnæus. M. Kunth, an able botanist, has recognized the flowers as a new genus of the *Rosaceæ*. About two drachms of the flowers in powder are taken in an electuary of honey, and ordinarily in twenty-four hours the patient passes the worm, but without purging. The whole of the worm is rarely expelled; but the patient follows his usual occupation, and, after a time, as the medicine is not unpleasant, and does not cause griping or purging, the dose is repeated. Dr. Aubert became a subject of tænia whilst in Abyssinia, and by taking aperient medicine after the Cusso, he completely relieved himself of it. The Bisenna is a species of conifera, much resembling the *Juniperus Virginiana* of Linnæus. The pulverised bark is employed, but not so generally as the Cusso, as it causes irritation, colic, and in some cases enteritis. The Abbatsjogo resembles the *Ixia bulbocodium* of Linnæus. It is less employed than either of the former species.

* *Bulletin de l'Academie Royale de Médicine*, Mars 15, 1841, and *British and Foreign Medical Review*, July 1841.

CLINICAL REMARKS ON TWO HUNDRED AND SIX CASES OF TAPE-WORM.*

BY DR. WAWRUCH.

During the period of twenty years, 206 patients affected with tape-worm, were admitted into the clinical wards of Dr. Wawruch: of these, 71 were males, 135 females. The oldest patient was fifty-four; the youngest three and a half years old; the greater number ranged between the ages of fifteen and forty. On the predisposing causes of tape-worm the author is able to throw little or no light. A great majority of the patients came from a particular district, and diseases of the abdominal or dermal systems in early life, seemed to have some influence. Thus, 43 patients suffered under ague; 20 under gastro-intestinal disease; 16 under typhus; 10 from herpes; 41 from tinea capitis; 42 from itch; 8 from scarlatina; 13 from measles; 2 from chronic nettle-rash.

In the female sex, the author remarks that the presence of these worms was almost always accompanied by some derangement or anomaly of the menstrual secretion, generally consisting in a late appearance of the discharge.

SYMPTOMS.

Some patients suffered very little, and were unaware of their being affected, until a portion of the worm was discharged; in other cases, the symptoms were better marked; those constantly observed were,

1. A dull pain in the forehead, with vertigo, and ringing in the ears.

2. Troubled sight, with a bluish circle round the eyes; œdema of the upper eye-lid; dilated pupil; rolling of the eye-balls; various disturbances of vision, as double vision, muscæ volitantes, &c.

3. Frequent changes of colour; loss of appetite, interchanging with voracious hunger; and a taste for certain substances.

4. Foul breath; earthy taste in the mouth; salivation; nausea and vomiting of a watery fluid towards morning.

5. Itching of the nose, anus, or vagina; grinding of the teeth, particularly during sleep.

6. Enlargement of the abdomen; rumbling of the bowels; a pinching, biting feel about the navel, with the sense of a foreign body moving in the intestines, especially towards morning; disappearance of those symptoms on taking warm broth, &c.; diarrhœa interchanging with constipation.

7. When the disease is of long standing, melancholy, and a great number of nervous

† *Medicinische Jahrbücher*, Feb. 1841, and *Provincial Medical and Surgical Journal*, July 10, 1841.

derangements; loss of some sense, partial or general convulsions, epilepsy, chorea, &c.

8. The most certain sign is the discharge of a portion of the worm, which may occur without any evident cause; occurs during some disease, as typhus fever, &c.; or is the effect of remedies.

TREATMENT.

The same method of treatment was adopted in all the 206 cases, except where the constitution of the patient, or some other particular circumstance, rendered a modification necessary.

As a preparatory step, all the patients took a laxative decoction, with sal ammoniac, for three, four, or five days, and ate nothing but weak soup thrice a-day. In eight cases, the worm was expelled by the mere effect of continued abstinence. The anthelmintic remedies employed were, castor oil, and the powdered root of the male fern. From one to two table-spoonfuls of the oil were given as a dose, alternately with one or two drachms of the powder twice or thrice a-day.

Enemata of oil and milk were frequently thrown up, to attract the worm towards the large intestine, and it was observed that the effect of the drastic was always most sure when given a certain time after the last dose of fern, than at once. The drastic purge employed was composed of equal parts of calomel, gamboge, and sugar, two to eight grains of each for a dose. In many cases a single dose brought the worm away, but in others, three to six doses were required. The period at which the worm was discharged was very various. In eight cases, as has been already remarked, it was expelled by the mere effect of hunger; in 13 cases, by the anthelmintics alone; in 11 by the first, in 14 by the second, and in 15 cases by the third drastic purge; and, generally speaking, it was expelled within one to twelve hours after the last drastic. In a few cases, two, three, four, (and in one) twelve days elapsed after the last purge, before the worm was expelled. The tænia is not exclusively a *solitary* worm, for in nine cases there were two worms, of different ages and development; in two cases three worms. In one very remarkable case, four worms were discharged, and this patient still suffers from the complaint. Of the 206 cases, only 26 had a relapse; twenty of these came twice, five thrice, and one of them four times to the hospital. Some came in two to four months; two in nine months; two in a year. Generally speaking, the patient may expect to be entirely freed from his disease, if he pass ten or twelve weeks without discharging any remnants of the worm.

LARTIGUE'S GOUT PILLS.*

M. Bouchardat proposes the following formula for preparing Lartigue's pills:—

Compound extract of colocynth	20	grammes
Alcoholic extract of colchicum seeds	1	,,
Alcoholic extract of digitalis	1	,,

Make an homogeneous mass, which may be made into pills of 15 centigrammes.

COMPOUND EXTRACT OF COLOCYNTH.

Pulp of colocynth	185	grammes.
Purified extract of aloes	370	,,
Bruised scammony	125	,,
Cardamoms	30	,,
Hard soap	90	,,
Alcohol at 25°	4	quarts.

Macerate the colocynth pulp for three days in the spirit of wine. Strain the liquor, and add the aloes, the scammomy, and the soap; evaporate to a proper consistence, and add the cardamons in fine powder at the close of the operation.

TESTS OF ARSENIC.

In a recent case of suspected poisoning which occurred to a lady of the name of Rawle, residing at Newport, we find the public prints reflecting upon the uncertainty of the tests of arsenic, in consequence of the failure of Mr. Herapath in detecting the presence of any. We may here fairly enquire what evidence is there, that any has been taken, when none is found? Are there no other poisons except arsenic? We have too much reliance on the accuracy and researches of such men as Orfila† and Dr. Christison in matters of this kind, to condemn the tests of arsenic upon such flimsy grounds as have induced the press in this case to decry them. In almost every case where this poison has been taken, and death has followed, it may, with very little difficulty, be detected if proper caution be employed; but we fear that in most cases, it alone is sought for, and when not found, the case is abandoned as one of doubt and uncertainty, and no other substance is searched after.

In investigations of this nature too much caution cannot be observed in order to set the mind at rest, and further the ends of justice.

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* *Journal de Chimie Medicale*, May, 1841.

† The minute portions of this substance detected by this eminent chemist, who has discovered that it exists naturally in animal bodies, is a complete refutation of the fallacy of tests.

STRENGTH OF HYDROCYANIC ACID.

To the Editors of The Chemist.

GENTLEMEN:—

Your correspondent, J. F., in asserting the *awful responsibility* attached to the dispensing chemist, seems to lose sight of the duties connected with his calling, and in which his responsibility alone consists. *Imprimis;* that of faithfully abiding by the very letter of the prescription, unless he detect error in the same, which it would undoubtedly be his duty to avoid confirming; and, *secundo,* in strictly adhering to the use of articles prepared according to the existing pharmacopœia, except the physician orders to the contrary, whereas, in the supposed case there would be a flagrant departure from the formulæ, which are correct.

I would ask, what right has the dispenser to substitute Scheel's acid for that of the pharmacopœia, in either case, especially in the former, where the medicinal strength (i. e. the diluted) is expressly ordered? Yet your correspondent supposes the substitution of the strongest medicinal preparation used, in defiance of this explicit direction, which would be to commit a gross error.

The pharmacopœial preparation is the only one authorized by the College, and as such, it is the article we are lawfully bound to employ when the administration of none other is indicated. Vide the order in council prefixed to the pharmacopœia.

The above is equally applicable to both cases, but should it be thought that the inutility of the dose requires that the latter should not be so summarily disposed of, I beg to state that it is usual, when medical men are desirous of Scheele's being employed, to write Acid. Hydrocyan. (Scheelei); and I believe it is generally allowed, not to be the province of the chemist to canvass the propriety or utility of the prescription which he is called upon to compound, as it is not to be supposed he can be familiar with the peculiar circumstances under which the same was written; neither is it for the dispenser to question the intention of the physician. I believe J. F's queries, as to "what means we have of distinguishing which ought to be employed?" and, "does the physician direct us?" &c., are sufficiently replied to; and further beg to observe, it is not compatible with the object of a pharmacopœia to distinguish between the relative proportional strength of the various preparations of manufacturers. The blame which your correspondent has attached to physicians generally, and to what he is pleased to call our "mutilated life and death pharmacopœia," it will be seen, lies at his own door; and should injury arise from such an occurrence as that supposed, it would be entirely attributable to the dispenser.

J. F. is referred to Dr. Paris's Pharmacologia, page 78 to 82; also to his appendix of the eighth edition of that excellent work, for further enlightenment on this subject.

I have the honor to be,
Yours respectively,
M. P. S. G. B.

FIELD MUSHROOMS.

PERSONS at this season of the year cannot be too cautious in the choice of mushrooms. Yesterday afternoon, a family named Harper, residing in Berwick street, Soho, nearly lost their lives by eating too freely of some stewed mushrooms, which in the course of the morning had been purchased of a country lad, who was hawking them in a basket about the streets, for sale. Shortly after eating the same, they were seized with violent retching attended with choleric pains in the stomach, which, had not medical assistance been promptly procured, would most probably have terminated fatally.

Besides several poisonous "fungi," there is a variety of the tuber, which, although an innocuous catsup may be made from them, are dangerous to be eaten, being highly indigestable, and apt to swell in the stomach, producing very painful and dangerous consequences.

The best way to test the quality of mushrooms, is to introduce a silver spoon, or a new shilling or sixpence, or an onion, into a vessel in which mushrooms are seething; if, on taking either of them out, they assume a dark discoloured appearance, the circumstance denotes the presence of poison existing among them; if, on the other hand, the metal or onion, on being withdrawn from the liquor, wears its natural appearance, the fruit may be regarded as genuine, and of the right sort. —*Correspondent of the Times,* Aug. 10, 1841.

SPURIOUS OPIUM.

To the Editor of The Times.

SIR:—

You will be conferring a favor on the medical profession, if you will permit me, through the medium of your valuable journal, to expose a most gross and flagrant imposition which has been, and for aught I know to the contrary, is still practised on them.

A young man of respectable appearance, professing himself a drug broker, called on me a short time since, and produced for sale a quantity of opium at 10*s.* 6*d.* per lb.; being surprised at the cheapness of such an article, I suspected all was not right, and interrogated him closely on the subject. He, in reply, said his name was B——, and represented himself as a clerk in the employ of Mr. G——n, who was in the habit of disposing annually of accumulated samples, at an immense sacrifice. Being won by this plausible tale, I purchased nearly two pounds

from him, and as it is a practice with me to submit my drugs to their usual tests before employing them, I did so with these samples, and very fortunately so, both for my own credit and the safety of my patients, for they turn out to be a heterogeneous compound of the vilest trash, possessing scarcely any of the active principle of this drug. I have deposited a sample with Messrs. Evans and Lescher, who are engaged in a series of experiments upon it, intending to bring the subject before the Pharmaceutical Society, at their next sitting. On making inquiries, I find that I am not the only one that has been duped, that such a person as G——n is not known as a drug broker, and that the whole turns out to be a gross fabrication of this hopeful scapegrace.

I have the honor to remain, Sir,
Your obedient Servant,
G. B. Childs, M.R.C.S.L.

Wood Street, Cheapside, Aug. 6, 1841.

ON THE EMPLOYMENT OF CHERVIL IN MEDICINE.*

Chervil has been used in medicine, in cases of contusion, swelling of the breasts, as an application to wounds, in glandular affections, in phthisis, dropsy, and in cutaneous disorders. M. Charbrely has recently employed it in decoction in acute conjunctivitis. He speaks highly of its use, and mentions several cases in support of its efficacy. He simply used the decoction in repeated fomentations of the diseased eye; it is probable that it must be dropped between the eye-lid and the surface of the globe of the eye.

SYRUP OF SULPHO-TARTRATE OF QUININE.†

R. Crystallized sulpho-tartrate of quinine	15	gram.
Distilled water	45	,,
Syrup at 35°	300	,,

Dissolve the salt of quinine in the water, and add the syrup, which will contain, per ounce, 24 grains of sulpho-tartrate of quinine.

EMPLOYMENT OF TANNIN IN IMMODERATE PERSPIRATION.

BY DR. CHARVET.

Dr. Charvet speaks highly of the employment of tannin in the profuse sweats to which persons labouring under disorders, especially phthisis, are liable. He mentions several facts in support of this mode of treatment: he uses this substance under the form of pill, in the dose of 2½ to 10 centigr. in 24 hours, combined with a little opium, which neither impedes nor assists its action.

Dr. C. prefers this substance to acetate of lead, which, under certain circumstances, has produced bad symptoms, and to white agaric, which often exerts a prejudicial action on the digestive tube.

* *Journal de Chimie Medicale*, July 1841.
† *Idem.*

TO CORRESPONDENTS.

A Subscriber will find a good receipt for an indelible ink in an article by Mr. Coathupe, in *The Chemist*, No. VI. Vol. I. p. 173.

An Assistant, Edinburgh.—The solution of cochineal is the best: we advise our correspondent to fill a number of phials with the solution, and to add the muriate of tin in different quantities to each, until he obtains the requisite shade.

Constant Reader.—It should be "Precipitated Calomel."

Mr. Horne.—Tartaric Acid.

A Constant Subscriber.—A solution of bichromate of potassa, will, we think, present all that our correspondent desires.

N. N.—There is; it is not permanent.

A Member of the Pharmaceutical Society had better apply to the Secretary of that society for the information he requires.

The Assistant had better write to the Secretary of the Pharmaceutical Society. Turner's, Brande's, or Noad's Chemistry; Pereira's Materia Medica; Brande's Pharmacy; and Burnett's Botany.

E. G. How.—Apply to our Publisher.

TO SUBSCRIBERS AND ADVERTISERS.

The Chemist, for the present year, forming Volume Second, will be completed early in December, when our Subscribers are recommended to complete their volumes without delay, to prevent disappointment. The Publisher will give full price to any gentleman possessing numbers I, III, and IV. of Vol. I.

Advertisers are again reminded of the value of the cover of *The Chemist* for all Works, and other Advertisements connected in any way with the Medical and Pharmaceutical Professions.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

PRINTED BY STEWART AND MURRAY, OLD BAILEY.

THE CHEMIST.

I. CHEMISTRY.

BRITISH ASSOCIATION. ELEVENTH MEETING.—(Concluded.)

Section B.—Chemistry and Mineralogy.

President,—Dr. Daubeny.—Vice Presidents—Prof. Daniels, and Col. York.

Tuesday, August 3.

I.

"On the Radical of the Kakodyle Series," by Prof. Bunsen.

The method recommended as being the easiest for procuring kakodyle in a pure state is the following:—

Chloride of kakodyle, carefully freed from the oxide by treatment with strong muriatic acid, is allowed to stand some time over chloride of calcium and quick lime, to remove the water and all excess of acid. It is then introduced into a distillatory apparatus carefully filled with carbonic acid, and containing some slips of clean sheet zinc. Any of the metals which decompose water will answer, but zinc is the best. It is probable that hydrogen or carbon would produce a similar decomposition with suitable modifications of the apparatus. The vessel is then hermetically sealed, and the mixture of zinc with the chloride is exposed in a water bath to a temperature of 212° Fah. for some hours. When the decomposition is complete, a white saline mass is formed, which melts into an oily liquid between 240° and 248° Fah.; while the tube is still hot, the point of the tube leading into the condenser is dipped below the surface of boiled distilled water: as the apparatus cools, the water rises into it. The tube is hermetically sealed; the water dissolves chloride of lime, leaving the excess of zinc and the kakodyle which falls as an oily liquid to the bottom—this is rectified twice or three times in vessels filled with carbonic acid as before; the water being afterwards removed by chloride of calcium in the usual way. Thus obtained, it is a colourless liquid, transparent and of a high refractive power, in appearance and odour much resembling the oxide of kakodyle, and ignites instantly on being brought in contact with air, giving off water, and carbonic and arsenious acids.

II.

"On the Production of Sulphuretted Hydrogen by the Action of Vegetable Matter on Solutions containing Sulphates," by E. Lankester, M.D.

Dr. Lankester stated that observation had enabled him to detect sulphuretted hydrogen in water, by the presence of some peculiar animalculæ which caused a red deposit—he found it in lakes and springs near Askerne, in the dropping well at Knaresborough, and other places situated on or near the great tract of magnesian limestone in that district. He then enumerated a series of experiments, instituted with a view of investigating the source of sulphuretted hydrogen, from which he came to the conclusion, that it arose from the decomposition of the sulphates, in contact with vegetable matter. In allusion to Prof. Daniell's experiments on the waters from the African coast, the author stated, that Dr. Clem has recently detected sulphuretted hydrogen to a very considerable extent in the sea waters of the British coast. Dr. Lankester is of opinion that the elements for the production of sulphuretted hydrogen are as abundant around our own island, as on the coasts of Africa; but it is not developed to so great an extent from the want of a high degree of heat.

Dr. Daubeny remarked, that running water soon lost its sulphuretted hydrogen, and the confervæ grew at Knaresborough immediately the waters were, by exposure, freed from this gas, thus distinctly marking its presence or otherwise.

Mr. Robert Hunt stated, that he had detected sulphuretted hydrogen in considerable quantities, in the water issuing from the clay slate of the bottom level of the Consols Mines, and also in some other samples of water collected in the deep Cornish mines.

III.

A paper was read from Dr. R. D. Thomson, 'On the Composition of Crystallized Diabetic Sugar.'

Mr. Booth made a communication on the subject of Spontaneous Combustion. — The author enumerated a great variety of vegetable and animal products which possess the property of passing spontaneously into combustion. He also exhibited a table showing the number of fires occurring in London, in a given time, particularizing the different trades, and, where it was possible to obtain the information, the causes of these fires.

The destruction of the *Talavera* being mentioned, Mr. Robert Hunt stated that he had been engaged, at the request of the solicitor to the Admiralty, in the inquiry which followed this fire, and had forwarded to the Admiralty two reports, which, to his own mind, most satisfactorily referred the fire to the spontaneous ignition of masses of oiled oakum, anti-attrition, oiled and painted canvas, sawdust, &c., which had been allowed to accumulate in a large bin, on the edge of the dock, immediately beneath the roofing under which the ship lay.

Mr. N. Hearder adverted to the spontaneous explosions of iron bomb-shells, instances of which had recently occurred, and mentioned some experiments which he had performed a few years since, on combustion in vacuo, but which, in consequence of an accident which deprived him of sight, he found himself incapable of continuing with accuracy. They related to the effect of diminished pressure in modifying and restraining combustion. The following are some of the experiments which he detailed:—Different mixtures of chlorate of potash, with loaf sugar, sulphur, arsenic, black sulphuret of antimony, &c., were successively introduced into the receiver of an air pump, together with a small vessel of sulphuric acid. The receiver was exhausted, and, by means of a sliding wire through the cap, a bunch of thread was made to touch first the sulphuric acid; and then the chlorate mixture, but in no case could any combustion be effected. A slight effervescence, and, in the dark, very faint scintillations of light were perceived. The experiment was reversed by throwing the mixtures into the acid, but without combustion. Into a champagne glass about one ounce of nitric acid was poured, and a few grains of chlorate of potash and phosphorus were then thrown in; in a few seconds brilliant flashes of light were produced under the acid; but on placing the glass under a receiver, and exhausting, the flashes ceased after a few strokes of the pump. On re-admission of the air the flashes again appeared, and so on alternately. In order to vary the experiments, Mr. Hearder contrived to keep a piece of platina wire in vivid ignition by a powerful galvanic battery, which, when the receiver was exhausted, was brought into contact with gunpowder, but without its being inflamed. The portions in contact with the wire fused and adhered to the wire, and were seen in a state of ebullition at a red heat on the wire, and appeared gradually to evaporate. During this process a dense brown smoke was observed to fall at the bottom of the receiver. Air was then admitted, and as soon as the barometer gauge indicated half the pressure of the atmosphere, the gunpowder inflamed with a very faint flash. The experiment was repeated, but nitrogen gas was admitted instead of atmospheric air, and the inflammation took place when one-fourth of the capacity of the receiver was admitted. A mixture of chlorate of potash and arsenic inflamed on re-admission of air, when the mercury had fallen two inches. Chlorate of potash and sulphuret of antimony required the admission of a much larger proportion of air to produce inflammation. Whatever combustible mixtures were used, the inflammation was always effected with the admission of a much less quantity of nitrogen than of atmospheric air. In experiments with antimony and arsenic, iron wire was used, instead of platina, the latter being always destroyed by the inflammation of these substances. Mr. Hearder considers that the restrained action thus observed arises from the extremely attenuated form which the gaseous matter assumes at the moment of its formation, since it must necessarily expand over the whole receiver, by which means its concentrated action upon the other ingredients is prevented.

Mr. Prideaux exhibited a specimen of a compound of oxide of lead with empyreumatic oil, produced in the distillation of wood, and forwarded by Mr. A. Tunstall, of Neath.—This compound, which had much the character of diachylon, was entirely soluble in boiling water, from which sulphuric acid separated the lead, and the oil floated on the surface.

Mr. Tweedy mentioned, that about six months ago, a specimen was shown to him by a respectable mineral dealer at Truro, of what he called molybdic silver. As, however, it was of a very fusible character — melting before the blowpipe readily, even in the flame of a candle—Mr. Tweedy conceived that bismuth must enter largely into its composition, and sent a small specimen to Mr. Prideaux for examination, who ascertained that it was nearly pure bismuth, he believed native. Some further specimens satisfied Mr. Tweedy

of its being natural, and not artificial, and of its great value. It was found in a mine near Truro, in a large unproductive sparry lode, and only in one spot.

It is observed by Dr. Johnson, "that it is better to see smoke brightening into flame, than flame sinking into smoke." This is a truth which none will dispute, and we should be glad indeed if we could bear our testimony to the illustration of the former part of the sentence, rather than to the sad, but strict, exemplification of the latter, in the recent meetings of the "British Association for the Advancement of Science."

The early sittings certainly gave the most promising indications and assurances of some extraordinary revolutions in science: they were composed of a galaxy of talent which dazzled all Europe, and gained the institution the name of the "Parliament of Science."

On the occasion of its meeting in Bristol it contained among its members the greater part of those who are celebrated throughout Europe, for their knowledge and discoveries in every branch of science. France, Germany, Italy, and other countries contributed their aid to sustain the dignity of the occasion, and to enlighten the world with their researches.

To the Association at this period the eyes of all nations were directed as to a centre from which would radiate the light of truth and knowledge—the surest source of advancement in the sciences, and arts, and the general benefit of mankind.

That the objects for which this Institution was founded are good, cannot be doubted; but in order to fulfil them it is necessary that the elements of which it is composed should be good also;—that they should be chosen from the *élite* of each profession, and not from the "οι πολλοι:" due attention to such a selection, with respect to all who are allowed to take part in its proceedings, would have ensured the prosperity of the Association in the same ratio as the neglect of it has hurried its decline and degradation.

We do not, however, intend to assert that very eminent individuals do not take part in the proceedings; but at the same time it cannot be denied that the instances are rare, and that for the most part the papers are read by persons by no means holding any distinguished rank in their departments.

From the meeting at Liverpool, to that of the present year at Plymouth, there has been a progressive and palpable falling off; and if some extraordinary exertions are not speedily adopted, we shall see the places of Gay Lussac, Faraday, Liebig, and Whewell occupied by mere tyros, who hope rather to take light from, than add it to, the Association, and we shall have to witness such a change in it as will compel us to admit with regret, "stat nominis umbra." That this decline in the interest evinced by the higher ranks is dependent upon some disapprobation of the management, cannot be doubted. To many, the feasting, the automatic promenading in assembly rooms at night, and the heterogeneous collection of all sorts, are sufficient reasons for their withdrawal from the meetings.

Considering the high position taken by this body, and the sounding title it at first acquired, we may ask how has it answered the expectations formed of it by the public? Let us, for instance, take the recent meeting at Plymouth, where, through some bungle, or what is worse, downright inability of the local profession, no medical section was formed, and that in a town where most especially are such ample opportunities and advantages for medical practice. But to come to the Chemical Section: is it worth while taking persons from all parts of this country and the Continent, and the expenditure of some thousands of pounds per annum, to hear read a few papers of the humblest pretensions? We do not mean to deny their relative merit; but when it is considered that they are all that are brought before the scientific of Europe, they are indeed worthy of the unenviable cognomen of "Mudfog," given to the association by the late Theodore Hook.

To give any critical account of the various papers, would be impossible as regards our space, and worthless to our readers. The first paper, that of Mr. R. Hunt, "On the Influence of the Ferro-cyanide of Potassa on the Iodide of Silver producing a highly sensitive Photographic preparation," is decidedly of importance to the beautiful art of photography. The one by Mr. De Moleyn, entitled, "Some Researches on the Development of the Electrical force," is perhaps the most valuable of any one read to the Association. That by Mr. E. A. Parnell, "On some Instances of Restrained Chemical Action," is likewise an instructive communication; as are also those

of Dr. Daubeny, Mr. Fownes, Mr. Gurney, and Mr. Prideaux: yet let any one but reflect, that they are the productions of a society meeting only once in a YEAR, and compare them with the papers read every WEEK, before the Academy of Sciences, at Paris, and he cannot fail soon to acknowledge that this body, with all its lumbering machinery, is a perfect farce. What would such men as Davy, Berzelius, Dalton, Priestley, Dumas and Wollaston think, to be obliged to travel some hundreds of miles to hear such juvenile productions?—for, who can deny that they are such, when contrasted with the researches of these men?

We may now ask, what has this Institution done for the advancement of science, which would not have been done without its aid? Are we to suppose chemists so culpably idle, as not to work for reputation unless they have the opportunity of collected meetings before which they can display their talents, and that this mere gratification of the weakest of puerile vanities alone urges them to exertions?

We greatly fear that the rewards, too, are subjected to great abuses,—that anything like fair play is not to be expected, much less granted; in fact, that all who are not so fortuitously situated as to have any intimacy or connexion with the committee, stand but little, if any chance; in short, that the business is what in vulgar language is termed a "job."

This migratory flight of unfledged philosophers, in its wanderings, seems to have shunned Manchester and London, as a pestilence, (query, from fear of ridicule?) until we suppose they are obliged, at last, reluctantly to venture, in the hope of recruiting their lost strength.

They are not like the wise men of old, who were to be found in the East; they, on the contrary, begun their lucubrations in the North, and are now getting from the West to the North again, after fluttering about like a moth in a candle, and we greatly fear to the same fate—destruction. We have often wondered that they have not added a gastronomic lecture, and also one of *soirées* and *conversazioni*, as we are sure they would tend greatly to revive the expiring state of the Association, and be so much in accordance with the feelings of the greater part of the members. We would recommend the former to include the most accurate statistical accounts of the provender of each particular district visited by them: this plan would be of use in furnishing the public with the qualities of the various bills of fare of these places. In Yorkshire, for example, we should find certain characteristics—cakes, hams, skate, &c. In Scotland, cod and Finnon haddies; in Ireland, mountain-dew and potatoes. What are the peculiarities of the Manchester market, we are not quite certain, except fine salted rounds of beef, baked instead of being boiled, and heads of celery, under the weight of which a porter would bend, added to as much of the real good "cratur" as you please, after a one o'clock dinner. The corporation of Manchester will, no doubt lend the society its aid in this section.

The soirée Section should contain an account of the male and female aristocracy of the neighbourhood, and we can bear our testimony to the superiority of the "Lancashire witches." The elegant displays at the assemblies in the evening are not behind any part of the kingdom. Like all such meetings, an impertinent ogling fop here and there may disturb the harmony or seriousness of the company; but else, there is nothing that can be noticed which presents any local disadvantage or disparagement to the visitors. Over this Section we should rejoice to see Mr. George Cruikshank elected president, whose delineations of human nature, from the highest state of refinement to the lowest grade of ignorance, vice and depravity, will be handed to the latest periods of time, and ever be viewed with instruction and delight by persons of all ages.

In conclusion, we may observe that the association must, it is evident, speedily change its movements and management, or it is too certain that its days are numbered, and that these changes, to be effective of good, must be directed to matter as well as manner. Under such alteration, we should have some hope of seeing its prospects of improvement amended; but continued in its present state, we cannot fail to observe its decline, nor to predict its rapid extinction.

ON THE COLLIERIES OF THE PARISH OF HALIFAX, AND THEIR CHEMICAL AND GEOLOGICAL RELATIONS.

To the Editors of The Chemist.

Elland, near Halifax, Sept. 8, 1841.

GENTLEMEN:—

I cannot refrain from supplying your Journal with another article, entitled "The Collieries of the Parish of Halifax, and their Chemical and Geological Relations." The subject is an engrossing one, and I have reason to believe will be read with considerable pleasure by many in this neighbourhood, who feel interested in the success of your periodical. I will render the paper as concise as possible, but should it extend further than is my present purpose, I trust you will pardon the freedom I may seem to have taken with you.

For a long series of years, the numerous shafts in this parish have served to afford employment to a large number of the humbler inhabitants, and this may be explained by the fact, that extensive strata of coal abound in several of its townships. The principal of these are North Owram, South Owram, Elland cum Greetland, Hipperholme cum Brighouse, Overden, and Shelf. The area of these six townships somewhat exceeds 18,123 English statute acres, and since the whole are of a most uneven character, several of the hills too, being rich in coal, it can be matter of no surprise that so much of this article of every day consumption should be mined amongst us. At the present period nearly 800 individuals are employed in the coal mines of the parish of Halifax. The largest portion of coal lies to the east of the river Hebble, which part of the parish includes the townships of North Owram, South Owram, Shelf, &c. Towards most of the valleys formed by the different hills, the coal beds shelve off, so that in the bottoms none is found.

The numerous streams which course these valleys, would appear to have in the lapse of ages, swept away the coal and the other strata resting upon it, so that from the sides of several of the hills the various formations, from below the coal upwards, are seen jutting out one above another in a most regular manner, inclining however considerably backwards as you approach their summits. Many of these eminences have an appearance peculiar to themselves; for being of an argillaceous nature, the perpetual decomposition of the clayey matter by atmospheric agencies, gives to them a rotundity and smoothness, differing considerably from the vast projections, or long and sharp ridges of quartz which characterize several other portions of the parish.

These elevations abound in excellent stone of a slaty kind, which rests superficial to the coal in three distinct measures, termed the upper, middle, and lower beds. These are respectively about half a yard, one yard, and from three to four yards in thickness, and are separated from each other by strata of clay and shale, of which that between the upper and lower bed is in some places three yards deep. The first bed, which is sometimes wantiog, is only calculated for field walls, the second for flags and roofing, and the third, which is by far the best, for the heavier and more durable purposes of masonry. From the quarries of North and South Owram, vast quantities of stone are forwarded to London, to the Continent, and to America, where it is in tolerable repute.

In those valleys where coal is not found, the red sandstone rock may be here and there seen peeping above the surface, which circumstance at once relieves us from the idea of finding coal, and considerably strengthens the opinion that the strata once resting upon it, have been, by some agency, carried away. In others of the valleys, formations are met with nearly allied to those of the hills which surround them, thus proving, either that in some extraordinary convulsion of nature, the hills here have been upheaved, or those plains composing the valleys, depressed. Both movements have some foundation in truth. That convulsions of an extraordinary character have once visited this parish, is abundantly shown by the numerous remarkable faults which have from time to time manifested themselves, both during extensive excavations for stone, and in mining for coal. Of the former, there is a remarkable example in the cutting at Ainley-top, near Elland, and of the faults in coal-mines, there are few colliers in this parish who have not had reason to complain. At Ainley-top, the strata in certain points, are thrown completely out of their place, and instead of continuing united with the rest, they have their edges pointing directly upwards, thus fairly disjointing themselves from the nearly horizontal strata of which they once formed a part. In some places, instead of being horizontal or perpendicular, like the example just alluded to, they incline at an angle of 45° either to the north or south, east or west. Similar instances are continually occurring in collieries, and in addition to this, the strata, though sometimes preserving their horizontal position, may be considerably raised or sunk.

With these preliminary observations, I will now proceed to consider the subject of the collieries. The number of these at present in active operation exceeds seventy. Formerly however they were not so numerous, though in all likelihood more profitable. The coal itself is not of the best quality, containing only a moderate share of round, and yielding a good deal of ashes. In all these properties, nevertheless, it varies much with the locality. The coal in the township of Shelf, is perhaps

superior to that in other parts of the parish. It is divided into hard and soft bed, the first being known by the duller appearance of its texture, and by its being from 25 to 30 yards nearer the surface than the second, which has a brighter lustre. Some of the shafts yield coal of a very inferior kind, which is used only for engines. The greater portion however answers well for kitchen fires, and is much improved by mixing it with the coal of some neighbouring districts, as that from Wyke, Wakefield, Dewsbury, &c., or with that from the north of England. It is customary for those who can afford it, to adopt this practice, but the great bulk of the population, no one will deny, burn the coal of the parish alone.

The coal, as might be expected by those versed in the geology of the district in which it abounds, is at a considerable distance from the surface, and is reached by boring or sinking, or by running galleries under the hill, commencing at its base. When obtained by sinking, the shafts are deeper or not, according to the situation of the coal as regards falls, faults, &c., and in proportion to the difference in elevation along the hills at which these are opened. The nearer they are to the summit of any hill, of course the deeper must the shaft be carried, before we can arrive at the coal. Most of the collieries in North Owram, Shelf, and Elland, have shafts. In many of these places, it lies at a distance of 120 yards from the surface, and is drawn up in corves or scoops by the aid of steam. In others, the soft bed is not more than 20 yards below the ground, and so many forces are brought into play to explain phenomena of this kind, that what is advanced to exemplify one, will never perhaps apply to another. When the soft bed is so near the surface, the hard bed may either be wanting, or by some extraordinary faults may have been brought, with one of its edges, into juxta-position with the soft, thus showing that the space between them was not originally deficient, but that the convulsive movements to which all the strata here have been subjected, have altered the relations of two distinct fields.

Again, although one portion of hard bed may descend almost to perfect contact with the soft, or within any number of yards of it, from one to thirty, yet the soft bed, contained in the strata set in motion, is as far from its accompanying hard bed as before; and this is explained by the fact, that in its descent a large field of soft bed was broken asunder from an adjoining one, and thus the hard bed fell down to its place, or to a point at any distance from its own former situation. In these motions, the strata may assume any direction of level, slope, or perpendicular, so that the two beds are together, or nearly so. In some instances, throws of this nature are so singular, that the coal cannot be excavated at all. The reader will now understand why, by the descent of one coal field, its hard bed will be brought in contact, or nearly so, with the soft bed of a neighbouring field, which may or may not have changed its position, and he will be enabled to explain why there are several collieries in this parish, two or three of which are in the township of Elland, where the strata are placed in this predicament. Added to this, both an upward and a downward motion may be communicated to a stratified series of any extent.

From the bottom of the shaft, which is termed the pit's eye, numerous galleries radiate in the direction of the coal. In other parts of the parish, the coal is obtained by running galleries under the hill. This is particularly the case as regards that line of elevations which unite the townships of Elland and South Owram. The entrances to these collieries are in Elland Park, i. e. on the side of the hill looking towards Elland, and are somewhat more exalted than the bed of the river Calder, which flows down the valley here, and along the northern embankment of which, the hills in question arise. Similar kinds of collieries are in the vicinity of Halifax, Shelf, &c.

The galleries of these pits are continually increasing in length in consequence of the quantity of coal which is, and has been excavated. From the grand gallery, a number of others branch off along the coal field. The coal when picked is conveyed away in corves or scoops, which are urged by boys and girls on railways constructed for their more easy progress either to the pit's eye, whence it is raised to the top of the shaft, should it have one, or should it be a gallery mine, it is drawn along the grand gallery into the open day, by a horse or pony kept for the purpose. In the older and poorer mines, instead of steam engines for drawing up the corves, there are either windlasses worked by the hand, or gins turned by horses. The quantity of coal, which has from time to time been excavated, is truly astonishing; but, as might be expected from the necessary increasing length of the galleries, the expense of mining it is annually augmenting, for the owner must either continue to extend his galleries farther from the pit's eye, or he must sink fresh shafts, both of which circumstances are attended with additional loss of time and money. In many parts of the parish, large fields of coal have already been consumed, and several pits are now closed in consequence of an inability to work them: this impracticability, arising from large collections of water filling the mines, and gathering even more rapidly than can be drawn off by engine pumps. In addition to this, the water cannot in many cases be drained away, either by allowing it to flow into the old works which are near, or by running what is termed a level, because it already

occupies a lower surface than the beds of the Calder and Hebble, these, for the most part, being considered the lowest channels by which all superabundant water escapes. This holds good only as regards the soft bed, for the hard is seldom, if ever, water bound, in consequence of its more elevated position.

From some shafts both hard and soft bed are obtained at the same time, while in others, but a single bed is mined, which may be either the first or second. When both are excavated, the task is effected by sinking down to the soft bed, from which point, galleries are not only bored in the line of this field, but if requisite, a long one is run up to the hard bed, ascending gradually like an inclined plane. This, however, can only well happen, where there are faults, which have brought the two beds nearer to each other. When the coal is reached, numerous galleries are commenced in the direction of this important measure, and any water which may rise easily glides to the lower field, from whence it is withdrawn in one or other of the ways before mentioned.

When but one bed is worked, this may arise from the other being so thin as not to be worth getting, or from the strata being in their natural position, or from the soft bed being unattainable in consequence of a great quantity of water overflowing the mine. Provided that we consider that the soft bed usually lies from 25 to 30 yards below the hard, we are not surprised at the difficulties encountered in the course of sinking for it. Owing to the iron ore which is found above it, the waters here have a cankered, ochreous character, and as such, deposit a good deal of peroxide of iron.

When the strata are regular, the soft bed is seldom touched, until the hard has been extracted.

Much of the coal yielded by several of the collieries, is, as I before stated, very indifferent, and as such only suited for engine fires. When, however, the demand is not sufficient for its exhaustion in this and other ways, it is made into cinders. In this case brick ovens are constructed for the purpose in the immediate neighbourhood of the pits. The coal, being nearly covered in, and the supply of air diminished, burns with a smothered flame, and thus yields up all its volatile ingredients, retaining however the fixed and carbonaceous. The ruddy flames of these ovens, like those from earthenware manufactures, form a remarkable feature in the landscape.

It will be perceived, that all the volatile products, including ammonia, tar, and sulphur, are allowed to escape, thus fairly depriving the manufacturer of the benefit which might, and would arise from preserving them. In this parish, however, I am not aware that they have ever been collected or applied to any useful purpose, as is the case in other parts of the country, where the smoke is conducted through proper horizontal tunnels to a capacious close tunnel, 100 yards in length, built of brick, supported on brick arches, and covered on the top by a shallow pond of water. In this way the bitumen is condensed. If, however, the coke maker is not profited, the land in the vicinity is materially improved by the condensation of the ammonia, &c. It must be remembered, that, in the manufacture of gas and coke at gas establishments, scarcely any of the volatile principles are allowed to fly off, and accordingly they are afterwards employed in several arts. The formation of coke from coal is analogous to that of charcoal from wood, the only difference consisting in the more complex nature of the compounds evolved during the latter process.

There is not, however, nearly the quantity of cinders made here as in the adjoining parishes, because much of this article is procured from the numerous gas establishments, with which Halifax and some of the adjacent villages are largely supplied. The cinders made at these gas works, and at the collieries, are sold to maltsters for their kilns, and to the railway company as fuel for the engines.

The thickness of the coal strata in the parish of Halifax varies from one foot to thirty inches, and cannot of course be excavated without taking away a certain portion of the useless material above it. In accomplishing this, the miner has to work in a recumbent or semi-erect position, and he is aided in his task by the light of a candle, or that of the safety-lamp when the air is foul. When disposed to be industrious, he can extract 18 corves, or 108 strikes, of coal a day, which, as he mines it, is conveyed away in one of these carts by a girl or boy, who is termed his hurrier. Girls continue at this work until they reach their 16th or 17th year, at which time they are taken to some other occupation.

The average price of coal is 7s. 6d. the dozen, a dozen containing 12 corves, and a corve being equal to 6 strikes. At some collieries, scoops are used in place of corves. The former contain only four strikes. For all household purposes, though both hard and soft bed are employed, the former is preferred, since it yields fewer ashes, a hotter fire, and does not consume so rapidly. It emits, however, much sulphureous vapour, and other noxious gases.

The hours of labour amongst colliers are from seven in the morning to four or five o'clock in the afternoon during the winter season, at wages of from 3s. 6d. to 4s. 6d. a day. In summer, however, the period is much shorter, and on an average, they do not work more than three days a-week throughout the year. In this parish there are, as I before stated, upwards of 800 hands employed in this mine, including men, women, and children. In point of morals, they are generally considered somewhat inferior to the other

classes of society. They are apt to indulge in habits of intoxication. After the labour of the day is over, they throng in great numbers to the nearest ale-house, where they continue revelling to a late hour. Leaving this, however, out of consideration, they are a very laborious and intelligent class of society. Many of them, who have been provident and economical during the early part of their career, are in comfortable circumstances during their old age ; but it cannot be denied that the majority are very indifferently situated. If they happen to have large families, and these be steady and industrious, they are enabled to maintain a respectable appearance. Of course, the winter season is to them a period of great fatigue. During the hours of labour, and whilst in the mine, they are exposed to much hardship. In consequence of its temperature, they work in a state bordering on nudity, probably up to the ankles in water, and because of the thinness of the coal strata, in an almost recumbent posture. Their only light is a candle, or the safety-lamp of Sir H. Davy. Notwithstanding their arduous exertions, they seem to enjoy this mode of life, and when the hours of labour are passed, they will sit in companies on the pit-hill, or in the adjoining public-house, talking over the arts and the dangers of their occupation.

Children are taken at the early age of seven, eight, and nine years, to aid their parents, and as such their education, whether in an intellectual or moral point of view, is much neglected. For this reason, the same rules which regulate factory labour, ought by all means to be introduced here. The confinement and close air of the pit would seem to impede their growth ; in proof of which it may be observed, that the miners of this parish, with very few exceptions, are scarcely of the average bulk and height which is common to manhood. Neither are they blessed with health or length of days. Owing to their position in the mine, to the inhalation of impure air, to the confinement, to the dirty, ochreous water which is often about their feet and ankles, and to their culpable method of living, they soon become afflicted with one or more of those affections to which the thoracic viscera are liable. Amongst these, asthma holds a prominent place, bringing in its train diseases of the heart, phthisis, and hydrothorax, by one or other of which, the poor collier is usually conveyed "to that bourne from which no traveller returns" prior to his attaining his fiftieth year. Constituting, as they do, so important a part of the community, and dying so young, the funeral of a collier has always appeared to me a very melancholy spectacle.

In addition to the above maladies, they are also liable to epilepsy, dyspepsia, sore eyes, and eruptions of the skin. The water of the mine, which generally contains metallic salts, &c. in solution, together with the dirt and mud which may close the pores of the skin, would seem to occasion the eruptions, as well as the soreness of the eyes. The sudden passage from dark to light, and *vice versâ*, may also have a tendency to produce this disorder, whilst their dyspepsia is the consequence of confinement and irregular living.

The chemistry of collieries is fraught with considerable interest; and in remarking on this subject, I will first make a few observations on the properties and qualities of the coal. Much has already been said on this head.

The hard bed has a duller and more resinous aspect than the soft. It contains pyrites. While burning, it often crepitates much, in consequence of the gaseous matter contained within its substance, which is incapable of escaping, but by bursting asunder the layers of coal. It burns with a reddish flame, and yields a few ashes which are red, but of little or no value as manure. It is somewhat brittle and lamellated, and may be broken easily in the direction of its plates. Its specific gravity varies from 1·33 to 1·48. Its constituents are carbon, bitumen, sulphur, and ashes, which last contain principally iron, with a slight proportion of potash and lime. When fresh mined, it is covered with a black carbonaceous powder, which causes it to soil strongly, and it now appears moist.

The soft bed invariably assumes a brighter lustre, and is not overspread with that black powder, which adheres to the hard bed coal. It burns with a large bright yellow flame, and, in consequence of the quantity of combustible gaseous matter which is then evolved, is employed at some of the gas works in this part of the country. It contains no pyrites, has a propensity to cake, and hence is often used for making coke. It is very brittle, breaking readily between the fingers, and is as distinctly lamellated as the hard bed. The distinction between hard and soft bed is not however so perceptible, when one piece is compared with another, as when a heap of the hard bed is compared with a similar quantity of the soft. Its sp. gr. varies, like the hard bed below which it lies, from 1·23 to 1·38. It yields white ashes, and occasions a good deal of dust during its combustion. Its constituents are carbon, bitumen, and ashes, which last, by the way, contain little or no iron, but potash and lime alone, and hence their utility as manure.

Having made these few remarks on the character of the coal, I must now direct my attention to the deleterious gases which are so often evolved in the course of mining. In the pits of this parish, both choke-damp and fire-damp occasionally betray themselves. Their presence is readily explained, when we take into consideration the power which carbon exerts in decomposing water when heated in close retorts along with the latter. Some such decomposition, is effected in the bowels of the

earth, where the action of water on decayed vegetable or carbonaceous matters in the coal, causes the formation of both the gases in question. Thus in the case of choke-damp, one portion of the carbon of the vegetable matter in a state of decomposition, unites with the oxygen of the water, thus forming carbonic acid or choke-damp, whilst in the instance of fire-damp, another portion of the same carbon combines with the hydrogen, and thus gives rise to carburetted hydrogen or fire-damp. I have known repeated instances of great loss of life from both these agents, but inasmuch as the mines are neither so extensive, nor the workmen so numerous as those in the north of England, accidents of this sort, when they do occur, fall on only a few. Choke-damp, or carbonic acid, and other noxious gases are often present, especially in newly opened shafts, or in those which have been unworked for some time. When such is the case, the workmen are in the habit of creating a draught of air, since every pit has what is termed its ventilator, viz. a second shaft, connected by means of a gallery with the principal one, through which the coals are drawn. This current is produced by letting down a kind of iron wicker basket, full of burning coals or cinders suspended at the extremity of a long chain into the primary shaft. This causes a current of air to rush down the ventilator, along the galleries, &c. thus in some measure displacing the foul air in the neighbourhood. Carbonic acid, when partially present, is sometimes displaced by water. When this gas makes its appearance unexpectedly, the collier often escapes the poisonous blast by lying with his face buried in the ground until assistance is rendered him. In this way he inhales fresh air from the earth. This sort of damp is much dreaded by miners. Feared, however, as it may be, the consequences accruing from its presence have never been so disastrous as those arising from fire-damp. In the north of England, instances have recently been put on record, where explosions from the carburetted hydrogen of mines, have in every respect simulated earthquakes. In this part of the country nothing to this extent can occur, though at the same time the few accidents which have occasionally happened, have been severe enough to impress a dread of fire-damp upon the minds of the oldest as well as stoutest miners of the parish.

Of late years, carburetted hydrogen has been evolved in greater abundance than customary, and this condition has brought about the introduction of the safety lamp, though still, owing to the carelessness of most workmen, explosions now and then happen from the use of naked lights. Experience, too, has shown that the Davy, though it may guard, does not completely secure one from danger. The apparatus made by Messrs. Upton and Roberts, of London, answers much better, and probably the improved lamp, more recently put together, and introduced to the notice of the world, by a French gentleman, would, if employed, exempt the collier from all hazard. The disastrous accounts which have lately arrived from the north, coupled with those of other coal districts throughout England, would imply the necessity of insisting especially on the employment of this provision, and it would probably be worth the while of Government to look to this, and to subject all to a penalty, or otherwise render them amenable to the laws, who attempted to work by the aid of any other light than that derived from the safety lamp. I am persuaded, that such a step is particularly requisite, for scarcely three months pass away, that are not rendered terrible in the annals of the collier by accidents from fire-damp. In some cases, it is so abundant as to be evolved from the surface. At the present time, in a field near Tyersall Dane, in the adjoining Parish of Bradford, a fissure having been made in connection with a coal-pit below, the damp escaped, and having by some means become ignited, it has burned for some time, and has attracted a considerable number of persons to the spot. A similar phenomenon occurred some years since on the Byerly estate in the same parish, and like instances have occasionally happened here. I have also collected this gas from stagnant pools.

Several other examples might be adduced, of the escape of carburetted hydrogen from the surface of the earth, and from the beds of rivers, in Great Britain, on the Continent, and in America, but space will not permit me to extend my inquiries into this interesting field. Both the hard and soft bed collieries are subject to be visited by fire-damp. Carbonic acid or choke-damp, though not wanting in the latter, is invariably most abundant in the former. The temperature of many mines differs considerably from the external air. When however there is a current in the galleries, the variation is very trifling, but if such is not the case, then the interior of the pit may exceed in temperature the top of the shaft by several degrees of Fahrenheit.

So much for the chemistry of coal and of the collieries. My next business is to inquire into their geological relations. A very few remarks must suffice, as my paper has already passed the bounds which I had prescribed to myself. What I have to advance may not so much prove true of any individual colliery as it is characteristic of most in the parish. The different strata which are dug through before reaching the coal, are pretty nearly as follows: 1. The superficial soil. 2. A stratum of clay. 3. A thin band of carbonaceous matter, probably the result of the decomposition of trees and vegetables, which may have flourished here formerly. 4. A layer of loose shale. 5. A stratum of argillaceous slaty rock. 6. Loose shale mixed with coaly matter. 7. Flag stone.

8. Shale and blue clay again. 9. Argillaceous rock, easily mined in large blocks, so as to suit the heavier and more important purposes of masonry. 10. Below the last bed, which is usually of great, but variable thickness, we reach another measure of blue clay and shale, intermingled with marl, lime, magnesia, and iron-stone. 11. Now we arrive at the carboniferous system, properly speaking, in the shape of the upper or hard-bed coal, which, in this parish, varies in thickness from 20 to 30 inches. The iron ore which rests upon it, occurs in rounded nodules, superior in size to the largest bombs. They are not applied to any use in this part of the country. 12. Below the hard-bed we have an alternation of clay or seat earth five yards thick—shale, ten yards—soft-bed band, nine inches—hard stone, or callion stone, as miners term it, four feet—shale, thirteen yards and a half—and clay iron ore, one foot, when we arrive at the soft bed, immediately above which the last mentioned mineral rests. It occurs in large flat pieces, with somewhat rounded edges. These are particularly plentiful in the collieries at Shelf, &c. from whence they are sold to one or other of the neighbouring foundries. The metal is principally in the state of a carbonate, but both the oxide and sulphuret are found, all three of which are well worth the trouble and expense of reduction. 13. The soft-bed which is here, varies in thickness like the hard-bed, but reaches only from twelve to twenty-five inches. 14. Beneath this measure we have shale, grit, and sometimes lime-stone; and lower still, the old red sand-stone makes its appearance.

When, however, pits are shallow, some one or more of the strata thus mentioned, which are encountered in sinking the deeper shafts, are entirely wanting. In place of much rock the series then consists of clay and shale, neither of which oppose any great obstacle to the attempt of the miner. The soft-bed band of from about nine to twelve inches thick, and alluded to under number 12, is generally extracted along with the soft bed, providing such can be effected. The collier, however, can never mine it in large pieces. It always crumbles under the pickaxe. It will not form cinders, like the soft bed, but answers well for engine fires. Seams of galena often lie in contact with the coal, and though not very abundant, yet several remarkable instances of its presence have of late years come under my inspection. In many cases, it is very pure, its sp. gr. being about 7·5. Pure carbonate of lime sometimes adheres to the galena. That, likewise, much iron abounds in the strata may be inferred from the circumstance of its having imparted a character to many of the springs and streams, and that sulphur also prevails, and that vegetable decomposition is going forward in the bowels of the earth is fully proved by the fact that one or two sulphuretted waters arise here.

The faults which occur in several of the strata, I may repeat, are well worthy the attention of the geologist. To one I have already alluded. They are often met with in mining the coal, particularly in the vicinity of Elland, &c. when in some instances, in consequence of these throws or faults, both the hard and soft beds are brought nearly on the same plain, or so much displaced as to form a variety of angles with each other. They are also rendered extraordinary by the strata of coal having been in many cases broken, and one field separated by several feet from another, which may itself rest either on a higher or lower level. Disruptions of this kind often puzzle the miner. Where they exist, there is usually a greater amount of water in the mine.

Having thus spared no pains to render the above article as correct in all its details as the almost endless variety of coal strata would permit, I trust it will not only meet with the approbation of the editors of *The Chemist*, but also of their numerous readers. In that case, any trouble I may have undergone in collecting and arranging the materials will be more than amply repaid.

I am, Gentlemen,

Very respectfully yours,

JOHN S. HILEY, M. B.

EXPERIMENTS ON CHONDRINE—A MODIFICATION OF ANIMAL GELATINE.*

BY DR. VOGEL, JUN.

CHONDRINE, which is a modification of gelatine, was discovered by HERR J. MÜLLER, Prof. of anatomy and physiology, at the university of Berlin. He first found it in an osseous pathological tumor, known by the name of *achondrome*, and he afterwards extracted it from permanent cartilages. This substance attracted the attention of several chemists, and especially that of HERR MÜLLER, of Rotterdam. HERR M. had already shewn that there existed a difference between chondrine and the ordinary size of commerce as well as that of fish, &c. By repeating his experiments, I was enabled, however, to find in chondrine some new properties which, with those already known, may contribute to a more intimate knowledge of this substance, and more positively demonstrate the difference between it and common size.

The chondrine which I used in my experiments was extracted from the cartilages of human bones, cut in small pieces, which I boiled in water for forty-eight hours. The

* *Journal de Pharmacie*, August 1841.

filtered liquor was evaporated to a gelatinous consistence and the residue treated with boiling ether, in order to remove the last traces of grease. I made comparative experiments with an aqueous solution of fish size.

Besides the re-agents pointed out by Herr Müller, for detecting chondrine, namely, alum, sulphate of alumina, per-sulphate of iron and acetate of lead, we know of only hydrochloric and acetic acids, which precipitate chondrine from its solution. I found that not only these two acids already observed by Herr Müller, but almost all the mineral, and many organic acids, have the property of precipitating chondrine from its solution.

As the precipitates occasioned by the acids are soluble in the slightest excess of acid, it is not easy to obtain them, for too large a quantity of acid prevents the formation of the precipitate.

In order to form the precipitate by means of sulphuric acid, only a very small quantity of that acid must be employed. In half an ounce of the aqueous solution of chondrine, the precipitate was formed, when a glass tube, previously dipped in sulphuric acid diluted with six parts of water was immersed in it. If one more drop of this acid be added, the precipitate instantly disappears. By adding a greater quantity of a solution of chondrine, the precipitate may be made to re-appear. The same thing occurs with the precipitates occasioned by the other acids, when those precipitates are soluble in an excess of acid.

Sulphurous acid forms in the solution of chondrine, a very abundant precipitate, which is not, however, soluble in an excess of that acid.

Nitric acid forms a very bulky precipitate, but it readily redissolves in an excess of acid.

Phosphoric acid precipitates chondrine from its solution and easily redissolves it; but the precipitate formed by pyrophosphoric acid is, on the contrary, insoluble in a great excess of the same acid. The action of chondrine on pyrophosphoric acid, may therefore serve as a characteristic to distinguish it from uncalcined phosphoric acid.

Phosphorous acid forms, like phosphoric, a precipitate soluble in an excess of acid.

Fluoric acid at first renders the solution cloudy; but by a larger addition, a precipitate is formed which is insoluble in an excess of that acid.

When a current of carbonic acid gas is passed into a solution, flocks are formed, which at first disappear; by continuing the current of carbonic acid gas, the fluid assumes a milky aspect, and, finally, the flocks unite, forming a white and very finely divided deposit. When the current is continued, all the chondrine is completely precipitated from its solution, and the fluid is not altered. The precipitate is not at all changed by the current of carbonic acid gas, and, consequently, it must be regarded as insoluble in a great excess of carbonic acid. On heating the precipitate, it becomes liquid, which also happens after some time, when it is spread on blotting paper to dry. This viscous fluid, which is formed by exposing the precipitate to the air, acts in exactly the same manner as chondrine, and is again precipitated by carbonic acid gas. When we add to the precipitate formed by carbonic acid a small quantity of any dilute acid, a thick scum, arising from the disengagement of carbonic acid gas, is produced, and the residue is chondrine combined with the acid employed. Hence the precipitate must be regarded as a combination of chondrine with carbonic acid. This combination does not appear to be very stable, because it cannot be preserved; for carbonic acid is spontaneously disengaged at the end of a certain time, as I have already said, and leaves for a residue, chondrine in a state of purity.

Chloric and hydriodic acids form in the solution of chondrine precipitates which are soluble in an excess of those acids. The precipitate formed by arsenic acid is soluble in a greater quantity of that acid.

A small quantity of tartaric acid is sufficient for precipitating chondrine from its solution. The precipitate is not soluble in an excess of tartaric acid. The precipitates obtained from chondrine by means of oxalic, citric acids, &c., act in the same manner.

None of the above-mentioned substances produce the least change in a solution of fish size. They may therefore be used for distinguishing a solution of chondrine from that of ordinary gelatine.

In its pure state, chondrine also contains 2·609 per cent. of inorganic salts. The elementary analysis of this substance, when purified, gave me in three experiments, as a mean, the following results:—

C	48·97
H	6·53
O	29·63
N	14·55
S	0·32.

This composition gives the formula H^{330}, C^{310}, O^{145}, N^{80}, which differs but little from Herr Müller's result.

As chondrine partakes the property of size, of becoming a jelly, of swelling in cold water, and of readily dissolving in hot, an idea suggested itself as to whether it was not possible to convert chondrine into gelatine, and *vice versâ*.

The observation that caustic potassa precipitates ordinary gelatine from phosphate of lime, gave Herr Müller the idea of endeavouring to change chondrine, by the addition of phosphate of lime, into ordinary gelatine, without any satisfactory result. It seems to me to result from the following experiment, that the difference between chondrine and size does not consist in a small quantity of phos-

phate of lime:—from a concentrated solution of ordinary gelatine, I precipitated the whole of the lime by oxalate of ammonia. The filtered liquid should have acted like chondrine, which was not the case.

The action of hydrochloric acid on the cartilages is very remarkable. I macerated some of the cartilages of the human ribs in water, very slightly acidulated with hydrochloric acid, at the ordinary temperature. After this, the acid water was decanted, and the cartilages washed several times with distilled water, until the last water was not rendered turbid by nitrate of silver.

Cartilages thus treated, gave, by boiling in water twenty-four hours, a gelatine entirely different, not only from chondrine, but also from ordinary gelatine. The filtered liquor, which was not acid, was evaporated to the consistence of honey, and did not set in a jelly. The evaporated residue, of a deep yellow, was neither viscous nor gelatinous, but, by slow boiling, it detached itself in fine layers, Dissolved in boiling water, none of the acids which precipitate chondrine produced the least change in this solution.

From the above experiments it results:—

1st. That the solution of chondrine is precipitated, besides hydrochloric and acetic acids already indicated, by many other acids, when they are added in very small quantity.

2d. That the precipitates formed by sulphuric, nitric and phosphoric acids are soluble in the same acids.

3d. That, on the contrary, the precipitates which result from the action of sulphurous, pyrophosphoric, carbonic, arsenic, tartaric, oxalic and citric acids on chondrine, are not soluble in the acids employed for precipitation.

4th. That all the acids above-mentioned do not effect any change in the solution of ordinary size.

5th. That the cartilages digested with very dilute hydrochloric acid form, by being boiled with water, a substance which is very different from chondrine, in losing by boiling its viscous and sizing property, and is no longer precipitated by any of the above-named acids, nor by alum and the persulphate of iron.

6th. That the difference between chondrine and ordinary gelatine does not consist in the inorganic salts which it contains, but that chondrine should be looked upon rather as a body differing from ordinary gelatine in its elementary composition,

RESIN OF GUAIACUM.

BY JAMES F. W. JOHNSTON, ESQ., M.A., F.R.S., PROFESSOR OF CHEMISTRY AND MINERALOGY, IN THE UNIVERSITY OF DURHAM.

To the Editors of the Chemist.

GENTLEMEN:—

IN the last No. of your useful little journal, you have inserted two short papers regarding guaiacum; as you are probably not aware of my analysis of this resin, I beg to forward you a copy of one of my papers on the resins, where you will find my results.

Believe me your obedient servant,

JAMES F. W. JOHNSTON.

Durham, Sept. 7, 1841.

When the resin of guaiacum of the shops is treated with alcohol in the cold, it is nearly all dissolved, giving a dark brown solution. On evaporating this solution in a flat dish, and heating it for twelve hours at a temperature rising from 180° to about 250° Fahr., a very beautiful transparent ruby-colored resin is obtained, brittle and electric, melting at 212° Fahr., and emitting an agreeable odor.

Of this resin carefully dried,

A 10·647 grs. gave $\dot{C}$=27·167 and $\dot{H}$=6·585.

B 10·995 grs. gave $\dot{C}$=27·975 and $\dot{H}$=6·733.

These results gave per cent.,

	A	B
Carbon	= 70·555	70·35
Hydrogen	= 6·870	6·80
Oxygen	= 22·575	22·85
	100	100

and they correspond more closely with the formula $C_{40}\ H_{23}\ O_{10}$, which gives

46 Carbon	= 305·75	= 70·37
23 Hydrogen	= 28·70	= 6·60
10 Oxygen	= 100·00	= 23·02
	434·45	100

This resin in a natural arrangement, therefore, must stand in the same group as the resins of dragon's blood and of gamboge, which, as we have already seen, may be represented by

Resin of dragon's blood	$C_{40}\ H_{21}\ O_8$
Resin of gamboge	$C_{40}\ H_{23}\ O_8$
Resin of guaiacum	$C_{40}\ H_{23}\ O_{10}$.

Salts of guaiacum resin.—When the solution of this resin in alcohol is added to an alcoholic solution of acetate of lead in excess, a white precipitate falls, which becomes blue on exposure to the sun's rays.* After separating the precipitate, ammonia throws down a further portion from the supernatant liquid. I have analysed three successive portions of the first of these compounds, which contains two equivalents of oxide of lead to forty of carbon; but the results are so little concordant with the results of the uncombined resin, as to render further investigation necessary.

With nitrate of silver this resin gives no precipitate, but on standing exposed to the light, the silver in considerable quantity is

* A delicate photogenic paper may be formed by first washing with an alcoholic solution of guaiacum resin, and afterwards with one of natural acetate of lead.

thrown down in the metallic state. I have not examined what change of composition the resin undergoes during this deoxidation of the metal.

ACTION OF METALLIC POISONS ON VEGETATION.*

BY M. VERVER.

M. VERVER, after having made the qualitative analysis of the soil which was the subject of his experiments, impregnated different parts of it:—

1st. with arsenious acid employed in three different quantities:
2nd. with arsenite of potassa:
3rd. with tartrate of potassa and antimony:
4th. with sulphate of iron:
5th. with sulphate of copper:
6th. with sulphate of zinc:
7th. with protonitrate of mercury:
8th. with bichloride of mercury.

The author sowed in these soils, properly prepared, barley, black wheat, and rye. He observed that, when the quantity of arsenious acid amounted to 1280 grains on a bed of earth of 64 square feet surface, germination was prevented; but that when the quantity of arsenious acid does not exceed 256 grains, the germination, and afterwards even the ripening of the seeds proceeded as usual. Having allowed the stems, leaves and seeds of the cereals thus obtained, to macerate two or three days, at a gentle heat, separately, with a solution of caustic potassa, and having introduced the different solutions, after having concentrated them and neutralized them by sulphuric acid, into Marsh's apparatus, he did not discover any trace of arsenic, which led him to conclude that arsenious acid spread on the earth, does not penetrate in appreciable quantity into the cereals which grow in it. The author took care to examine the earth in which they had been grown, and found that it contained arsenious acid in the soluble state. It would therefore seem that even when they are constantly in a soil containing arsenious acid, the roots of cereals do not take up an appreciable quantity of poisonous matter. It is to be regretted that the author, in seeking for arsenic in these cereals, did not adopt the method of carbonizing the plants by pure nitric acid.

The author has also proved that, in the soil charged with arsenious acid, in which germination had not taken place, the seeds had undergone only the commencement of vegetation. These, submitted to his process of analysis, showed him an appreciable quantity of arsenious acid, which tends to prove that the acid, by penetrating into plants, stops their vegetation; so that it is hardly probable that it should be met with in large quantity in a healthy vegetable, even though grown in a poisoned soil.

The author having impregnated earth with arsenite of potassa, found neither this compound, nor arsenic, in the cereals which he grew in it; but he remarked that the arsenite had become nearly insoluble in the soil, doubtless, on account of having been converted into arsenite of lime by the reaction of the carbonate of lime in the soil on the arsenite of potassa.

The author did not find in the cereals the tartrate of potassa and antimony which had been mixed with the soil in which these vegetables germinated, and where these seeds ripened; but here, also, the antimonial salt had become almost insoluble in the earth.

By adding sulphate of iron to the land, he ascertained that the cereals which grew in it contained in all their parts, and even in their seeds, more iron than those which grew in an ordinary soil; so that it seems that innocuous metallic compounds are more easily absorbed than the others, although sulphate of iron is also decomposed in the earth, and generally becomes insoluble.

By operating in the same manner with sulphate of copper, he also succeeded in demonstrating the presence of this metal in all the parts of the cereals grown on a soil thus prepared. The seeds manifested the presence of this metal, as well as the stems and leaves, although in smaller quantity. The cereals grown on a soil not impregnated with cupreous salt did not present the author any indication of the presence of copper.

The employment of acetate of lead mixed with the soil furnished only negative results; the cereals did not take up an appreciable quantity, probably on account of its speedy decomposition by the soil, which rendered it insoluble. Sulphate of zinc, protonitrate, and bichloride of mercury acted in the same way. These salts, mixed with the soil in small quantity, did not perceptibly influence their germination and vegetation, but on surrounding the plants in a pot with a strong solution of corrosive sublimate, the author found that they perished in a few days, and in this case chemical analysis demonstrated the presence of mercury in several parts.

From these experiments, the author concludes that poisonous metallic substances may, without inconvenience, be mixed with the soil, before the seeds are sown, and without any fear that the cereals which may germinate and vegetate in this soil shall contain them in appreciable quantity.

This memoir, which is the result of a great number of experiments, is deficient with respect to the analytical methods by means of which the author sought to detect the presence of foreign substances in the plants. His investi-

* *L'Institut*, No. 397, August 5, 1841.

gations do not appear to have been always conducted with sufficient care to dispel all doubt as to the value of the negative results obtained.

ACTION OF METALLIC POISONS ON VEGETATION.*

BY M. LOUYET.

M. LOUYET states in his memoir that having divided a garden into several squares or compartments, he mixed the soil in various proportions with arsenious acid, binarseniate of potassa, and sulphate of copper, and that he afterwards sowed in the earth, thus prepared, wheat, barley, corn, garden-cress, and peas. With respect to arsenious acid, he observed, that if the proportion mixed with the soil were too great, germination was prevented; in the contrary case, it took place without interruption, and the different parts (stalks, leaves, and seeds) of the plants which grew in these poisoned soils having been carbonised with nitric acid, did not yield any traces of arsenic in Marsh's apparatus. We may here remark, *en passant*, that the author does not appear to have freed the residue of the carbonisation of these plants from the nitric acid employed, before introducing it into Marsh's apparatus. He should have neutralized this acid with pure potassa, and then have driven off or displaced the nitric acid by pure sulphuric acid; for it is known that the presence of nitric acid in Marsh's apparatus may prevent the disengagement of the arseniuretted hydrogen, which is promptly oxidised or decomposed, under the influence of this acid.

The addition of binarseniate of potassa to the soil is opposed to the germination of plants, and therefore presented nothing remarkable.

Sulphate of copper did not prevent vegetation. The author also ascertained that it became insoluble in the earth with which it was mixed, doubtless by the decomposing influence of the carbonate of lime on this salt. The author could not detect traces of cupreous matter in the vegetables, which grew in the soil with which he had mixed the sulphate of copper; but as the analytical processes to which he had recourse on this occasion do not appear to us to have been executed with all necessary care, we entertain some doubt as to the absolute absence of copper from the vegetables, taking into the account the opposite results of different experiments tried by other men of science. It appears, indeed, from these experiments, that plants which have been raised in a cupreous or ferruginous soil, contain ever so little of these matters, which may penetrate them either in the state of carbonates dissolved in water charged with carbonic acid, or in the state of oxides dissolved by aid of certain principles of the earth.

The author also proved that by introducing into the soil, balls made with a mixture of arsenious acid and farina, as agriculturists often do, neither germination nor vegetation is in any way interrupted, and no arsenic is found in plants grown in this soil, although the poison is found in the earth, in the soluble state several months after its introduction.

The introduction into the soil of either arsenious acid or binarseniate of potassa in powder at the roots of wheat and garden-cress in full vegetation, did not injure those plants, and the poisons were not absorbed. It was not the same when the plants were surrounded with an arsenical solution. A strong plant of *Polygonum Orientale*, in full flower, having been surrounded by a solution of binarseniate of potassa, perished in about twenty-four hours, and the author succeeded in detecting the presence of arsenic, not only in the stalks and leaves, but in the seeds. It therefore appears that metallic poisons may penetrate into the seeds of vegetables, at least under certain circumstances: this was hitherto a matter of doubt.

The author observed, that we cannot by the same means cause solutions of metallic salts, which have the property of being decomposed and rendered insoluble in the earth, such as sulphate of copper, acetate of lead, &c., to penetrate into vegetables.

He afterwards examined the action of dissolved metallic compounds on entire vegetables plunged with their roots into the solutions; and he observed that in this case the metallic compound penetrated into all parts of the vegetable, and even into the seeds of the cereals from which he extracted it, by simply boiling the seeds in water. The author thus proved the penetration into all parts of the plants, of solutions of binarseniate of potassa, arsenious acid, bichloride of mercury, sulphate of copper, persulphate of iron, ferro-cyanuret of potassium, and acetate of lead.

From the results of the author's experiments we are tempted to believe that there is no danger to public health to be apprehended from the practice followed by many agriculturists of spreading arsenious acid in fields for the purpose of destroying animals injurious to the crops; for this poison, even when dissolved by the water of the earth, does not seem to be capable of penetrating, in any sensible quantity, into plants, without stopping the vegetation, and thus preventing the ripening of the seeds. It is to be regretted, however, that the author's experiments do not seem to have been sufficiently numerous, nor made with enough care, and in circumstances calculated to dispel all doubts as to the accuracy of the conclusions at which he has arrived.

* *L'Institut*, No. 397, August 5, 1841.

PROCESS FOR THE PREPARATION OF UREA.*

BY JUSTUS LIEBIG, M.D.

The ordinary process of extracting the urea from urine, consists, as is known, in precipitating by nitric acid, urine evaporated in the sand-bath, to a syrupy consistence, in purifying by repeated crystallisations the nitrate of urea obtained, and in decomposing it by carbonate of baryta or potassa; and finally, by separating, by means of alchol, the urea from the nitrate of baryta or potassa. This is a tedious and expensive process: with 1875 grammes of nitric acid, we rarely obtained more than 64 grammes of pure urea, and in this respect, at the present low price of ferro-cyanuret of potassium, the following process deserves the preference.

Twenty-eight parts of perfectly dried ferro-cyanuret of potassium are mixed with 14 parts of peroxide of manganese, and both are reduced to as fine a powder as possible: the mixture is heated on an iron plate (not in a crucible), over a charcoal fire, to a slight red heat; at this temperature it inflames, and is gradually extinguished; by stirring it several times, it is prevented from agglutinating, and the access of air is facilitated. The extinguished mass, after being cooled, is treated by cold water, and the liquor is mixed with $20\frac{1}{2}$ parts of dry sulphate of ammonia of commerce, or that purposely prepared by saturating sulphuric acid by carbonate of ammonia and evaporating to dryness. It is as well to set aside the first concentrated washing water furnished by the extinguished ferro-cyanuret of potassium, to dissolve, without heat, in the last, the sulphate of ammonia, and to mix the first with that solution. There is geuerally formed an abundant precipitate of sulphate of potassa; the supernatant liquor is decanted, and evaporated in a sand-bath or warm place, taking care to avoid boiling; there are again deposited crystalline plates of sulphate of potassa, and we must continue to decaut the liquor until no farther separation is possible. The last decanted liquid is then evaporated to dryness, and the residue is treated by boiling alcohol of 80—90 per cent.; this dissolves the urea, which crystallizes on the cooling and evaporation of the alcohol, while the sulphates are not dissolved. This process furnishes us with 375 of ferro-cyanuret of potassium, nearly 125 grammes of completely colorless and beautiful crystallized urea.

By the extinction in the air of ferro-cyanuret of potassium mixed with peroxide of manganese, very soluble cyanate of potassa is formed, which dissolves without decomposition in cold water; it must not be heated with water, as it is then decomposed, as is known, into ammonia and bicarbonate of potassa. When the cyanate of potassa is mixed with sulphate of ammonia, there are produced sulphate of potassa and cyanate of ammonia, which is converted into urea, at a gentle heat.

The quantity of oxygen of the peroxide of manganese, is not, as will readily be observed, nearly sufficient for converting all the cyanogen of the ferro-cyanuret into cyanic acid; but an increase in the proportion of this oxide, has the inconvenience of changing a portion of the cyanate formed into carbonate of potassa: it is better, therefore, to obtain from the air the oxygen in which the peroxide of manganese is deficient. Experiments for converting all the cyanogen of the ferro-cyanuret of potassium into cyanic acid by the addition of the calculated quantity of peroxide of manganese and carbonate of potassa, have not given a better result than its extinction in the air with an insufficient quantity of peroxide of manganese.

It sometimes happens that the solution, which contains sulphate of potassa and urea, is colored yellow by the hydro-ferro-cyanuret of ammonia or potassa, which is dissolved in the alcohol and turns the crystals of urea yellow; it is easy to purify it by adding a small quantity of a solution of sulphate of iron. After the separation of the Prussian blue formed, carbonate of ammonia is added, which decomposes the excess of the salt of iron, and decolors the liquor. This is afterwards evaporated and treated in the manner indicated above.

* *Annalen der Chemie und Pharmacie*, Vol. xxxviii, page 108.

ON THE CONVERSION OF URIC INTO HIPPURIC ACID, IN THE URINE OF PERSONS WHO HAVE USED BENZOIC ACID.†

BY M. DE BOUIS.

In the course of a series of investigations undertaken chiefly with the view of arriving at means of dissolving urinary calculi, in the bladder, M. de Bouis proved the fact of the conversion of uric into hippuric acid under the influence of benzoïc acid internally administered.

"Benzoïc acid," says M. de Bouis, "was administered at my request, by Dr. Rayer, to two patients at *La Charité*. The result of this trial, to which I was led by the indications of Dr. Ure, will appear in all its importance, if we call to mind the fact that uric acid and the urates are but very little soluble

† *Comptes Rendus*, No. 7, Aug. 16, 1841.

in water, while hippuric acid and the hippurates are much more so. Indeed, 18 parts of water dissolve 1 part of hippurate of lime: 480 parts are required for dissolving the corresponding urate."

NEW OXIDE OF IRON.*

This combination has been obtained by M. Fremy. It communicates a violet colour to water, and possesses a powerful dyeing principle. It resembles manganese chameleon. It decomposes readily when boiled with an alkali or organic substance having an affinity for oxygen, and is converted into oxygen and sesqui-oxide of iron, of a yellow colour. This combination is a perferrate of potash, which may be procured by calcining peroxide of potassium and peroxide of iron. Fremy has shown that the appearance of a chameleon colour is no proof of the presence of manganese, as it may be confounded with the new oxide of iron. Fremy forms this oxide by igniting a mixture of potash and peroxide of iron; a brown mass is the result, which, by digestion in water, gives a beautiful violet-red solution. This compound is very soluble in water. A large quantity of water decomposes it in the course of time. It becomes insoluble in very alkaline water, forming a brown precipitate, which readily dissolves in pure water, and affords a fine purple solution. It appears much less stable than manganate of potash. A temperature of 212° decomposes it immediately; all organic substances decompose it. It is consequently impossible to filter the solution. It is impossible to isolate this compound, for when the red solution is treated by an acid, when the potash is saturated, oxygen is disengaged, and peroxide of iron precipitated. If the acid is in excess, it dissolves the peroxide, and gives rise to the formation of peroxide salt of iron.

IMPROVED METHOD OF PREPARING PHOSPHORUS.*

By the usual method of preparing this substance, which is of great importance in the manufacture of lucifer matches, so many gases are at once disengaged, that there is much danger from explosions. In order to avoid this inconvenience, the mixtures of phosphate of lime, charcoal, and some parts of sulphuric acid should be well heated in a copper vessel, the bottom of which has been previously heated to redness. This temperature will be sufficient to drive off all the water, which usually amounts to 10—15 per cent. By this means much less phosphuretted hydrogen is evolved. It is best to mix at first only about 1 per cent. of charcoal with the phosphate of lime, and only after having heated the mixture to redness—to add the remainder of the ignited charcoal in order to volatilize the water and the sulphuric acid; because if it is added all at once, the water begins to volatilize at the time when the phosphorus is disengaged. By this plan, very little phosphuretted hydrogen gas is emitted, the phosphorus produced is much more pure than that of commerce; and the second distillation is no longer necessary, since the oxide of phosphorus which remains can be readily decomposed into pure phosphorus and phosphoric acid by treating it with dilute nitric acid at the temperature of 140° to 158°.

CARBONIC ACID OF THE AIR.‡

BY M. BOUSSINGAULT.

M. Boussingault read to the Academy of Sciences, Paris, at its sitting of Aug. 16, 1841, a Memoir, containing the results of investigations which he had made on the quantity of carbonic acid contained in the air of Paris, with the view of determining whether the fact of a greater population is capable of perceptibly augmenting the proportion of carbonic acid which the air contains. The method which he adopted, was based on that proposed by M. Brunner, which consists, as is known, in passing, by means of aspiration produced by the flowing in of a liquid, a determined volume of dry air by a system of absorbing tubes, capable of retaining carbonic acid. The increase of the weight of the tubes gives that of the acid.

Before explaining the results which he obtained by operating in Paris, M. Boussingault sought to estimate the quantity of acid which is daily produced in it. The agents of production which he reckoned in this calculation, are to the number of eight. The following is the enumeration as well as the approximative value fixed according to data, which we will not explain in detail:—

Agents of production.	Carbonic acid produced in twenty-four hours.
Population	336777 cubic inches.
Horses	132370
Fire wood.....	855385
Wood-charcoal ..	1250700
Pit coal	314215
Wax.....	1071
Tallow	25722
Oil	28401
	2944241

* *Athenæum*, No. 719. † *Athenæum*, No. 720.

‡ *L'Institut*, No. 399, August 19, 1841.

M. Boussingault's experiments were begun in January, 1840, and continued, with some interruptions, until July, 1841: they comprise 142 days. The mean quantity of carbonic acid found in the nine months during which his apparatus was at work, was as follows: —

1840. January, 3.5 in 10,000 volumes of air.
August, 3.8
September, 4.0
October, 3.8
November, 3.7
December, 3.8
1841. March, 4.2
May, 4.3
July, 4.3

The mean deduced from the whole of these observations, is 3.97 in 10,000 vol. of air, taken in Paris. This result was obtained by operating on 7271 litres, at 0° and 0m 76 pressure.

By consulting a table placed at the end of the memoir, it is seen that the maximum quantity of carbonic acid was observed on the 9th of September, 1840: it was 6.7. The minimum proportion was presented on the 10th of December: 10,000 of air gave only 2.2 of carbonic acid.

If these results be compared with those previously obtained by other chemists, we find, for 10,000 volumes of air:—

At Paris, 4.0 according to M. Thenard.

In Switzerland, 4.15 from 104 observations of M. T. de Saussure.

At Groningen, 4.20 from 90 experiments, by M. Verver.

At Paris, 3.97 from 142 experiments, by M. Boussingault.

An experiment made by M. Boussingault, seems to prove that the air respired in Paris does not contain appreciably, more carbonic acid than that of the country. Indeed, on the 21st of May, 1841, a comparative experiment made at Paris and at St. Cloud, gave him:—

At St. Cloud.. 0.000413 carbonic acid in vol.
At Paris 0.000414

And in this experiment the proportioning of the carbonic acid may be relied on to $\frac{1}{50}$.

ON THE INCONVENIENCE ATTENDING FREQUENT ALTERATIONS OF CHEMICAL NOMENCLATURE.

BY MR. W. A. SCOTT.

Much confusion and even danger have arisen from the practice of frequently changing the names of the chemical bodies used in medicine; so great has the inconvenience been felt to be, as to render it a matter of grave consideration with the learned, whether the more ancient names, as calomel, corrosive sublimate, James's powder, &c. are not more serviceable than the more descriptive ones which modern chemistry has substituted. But if the mere changing of a name be felt to be a great evil, it is immensely increased, when the greatest authorities are not agreed upon the propriety of the alteration, each adopting his own system of nomenclature, and thus causing endless confusion, and to the incipient chemist the greatest perplexity.

My attention has been drawn to the subject by observing the discrepancies which exist between the last London Pharmacopœia and Prof. Graham, of University College, and as the subject is not foreign to the design of your periodical, I shall trouble you with a few remarks upon it.

In the last Pharmacopœia, appears for the first time, the equivalent numbers of such bodies as are used in medicine, and upon this, is of course based the nomenclature adopted in the work; on passing your eye up these numbers, and comparing them with those given in Graham's Chemistry, there will appear several grave differences, some of the numbers being doubled or trebled, whilst others are halved; for instance,

Atomic weight of	In Pharm.	In Graham.
Copper	64	31.71
Arsenic	38	75.34
Antimony	44	129.24
Phosphorus	12	31,44!!!
Mercury	200	101.43

Now, passing over copper, arsenic, antimony and phosphorus, as being of less moment. let us enquire what this change involves in the case of mercury? It is evidently impossible with this alteration to preserve unchanged the names of the several preparations as given in the pharmacopœia, and accordingly we have such changes introduced, as, if not properly looked after by the pharmaceutical chemist, will give rise to innumerable mistakes. e. g.

	According to the Pharm.	According to Graham.
Black oxide	Oxide of merc.	Suboxide merc.
Red ,,	Binoxide ,,	Oxide "
Calomel	Chloride ,,	Subchloride
Corrosive sub.	Bichloride ,,	Chloride ,,
,, ,,	Bycyanide ,,	Cyanide ,,
Yellow iodide	Iodide ,,	Subiodide ,,
Red ,,	Biniodide ,,	Iodide, &c.

Now, let us suppose the juvenile chemist, who, with laudable desire for self improvement has just been studying Graham's Chemistry, (the best work on the subject), is called away to compound a prescription in which hydrarg. chlor. P. L. occurs, would not serious consequences result from the substitution of Graham's chloride of mercury? and if so, ought not the matter to be well attended to by those who have the superintendence of them? But you ask, what remedy do I propose in this land of liberty, where each follows his own sweet will in naming chemical compounds? My plan is as follows:—let the "parliament of science," i. e. the "British Association," be empowered to appoint a committee, the

officers of its own "Section B," if you will, to investigate the claims of any who may propose to re-christen nature's bantlings, and if approved, stand sponsor to, and be responsible for it to the public, until superseded by the fiat of a subsequent committee. This committee may be appointed annually, as the officers of the section are at present, and would at least ensure uniformity for the year, and I think British chemists would bow to the decision.

Another matter there is which ought to be settled by authority, viz., whether oxygen or hydrogen be adopted as unity in the scale of equivalents: on this question great diversity exists; Graham and Liebig preferring oxygen (= 100). whilst Turner, and the London Pharmacopœia, give hydrogen (= 1). For my own part, the hydrogen series seems most convenient; the numbers being smaller are more easily retained in the memory, and if, as Dalton, Thomson, and others have asserted, all bodies are multiples of hydrogen, there seems no objection to its general adoption.

LONDON ELECTRICAL SOCIETY.

IMPROVMENTS IN ELECTRO-GILDING AND ELECTRO-PLATING.

Tuesday, Sept. 21st.—Of the papers read this evening, one is of peculiar interest: *An account of a method of Electro-gilding and Electro-plating, at the expence of the Anode*, by Chas. V. Walker, Esq. Hon. Sec.

The author states that these objects have been accomplished hitherto by the use of a single cell, and, therefore, at the expense of a salt of gold or silver. These salts are troublesome to prepare, and are expensive; but as this plan has been so generally adopted, he conceived that there might be some fundamental difficulty connected with the other mode. As, however, no one had written on the subject, he was induced to go through a series of experiments with a decomposition cell, in order to determine whether the anions would combine with gold and silver anodes; for if so, the operations of plating and gilding might be rendered more *simple*, more *sure*, and more *economical*. He selected that salt, which, from its having been patented, may be assumed to rank first in the list, preparing solutions by dissolving the oxides of silver and of gold, each in a solution of cyanide of potassium. He experimented upon electrotype medals, &c., electrotyping the solutions respectively with a silver and a gold anode. After a few seconds of action, deposites are obtained; the medals are removed and polished, and re-immersed, according to the thickness required. The author describes the mode of preparing the surfaces for gilding and silvering, and the management of the anode. He also describes the arrangement for obtaining *thick* deposites. All this however he conceives to be of minor importance, compared with the fact, that the cyanogen, released at the anode, combines with it, whether it be *silver* or *gold*, and destroys a portion, equivalent to that deposited on the surface of the medals; and thus the strength of the solution is maintained, and *the expense of the operation is reduced to a minimum*. The deposition is effected in glass cells, and thus the eye can detect the regularity of the process. The anodes were gold silver wire, and silver plate. They were considerably consumed. In illustration of this communication, Mr. Walker submitted to the society a series of medals, silvered and gilded in this manner.——Several other papers were read. In one was a test by Dr. Leeson, recommended to be applied to the sulphuric acid employed in electro-chemical purposes, viz. a solution of sulphate of indigo. If, after mixing this with the acid and applying heat, the blue colour disappears, it indicates the presence of nitric acid; an impurity far more detrimental to the zinc plate than is imagined: for it attacks the mercury and exposes portions of the zinc so as to form elementary pairs and to produce a great amount of local action. Mr. Grove recommends platinized silver gauze for Mr. Smee's battery, he has prepared one with copper gauze, and gains considerably; he had been unable to procure silver gauze. The secretary who made the communication, recommended the deposition of copper on copper gauze; then the deposition of silver, and lastly, platinization.

REVIEW.

ELECTROTYPE MANIPULATION: *being the Theory, and plain Instructions in the Art of Working in Metals, by precipitating them from their Solutions, through the Agency of Galvanic or Voltaic Electricity.* By Charles V. Walker, Hon. Sec. Lond. Elect. Soc. Illustrated by Wood Cuts. Fifth Edition, with Additions. London: George Knight and Sons, Foster Lane, Cheapside.

Of a work which has gone through five editions, little need be said in the way of praise. This little treatise is already well known to the public, by whom its merits have been duly appreciated. Its most distinguishing characteristics are, besides its cheapness, its adaptation to every capacity, its explicitness, and the vast quantity of information condensed in so small a space. To those who cannot afford to purchase Smee's more expensive work, this will be invaluable: they may obtain all the information required for electrotype

experiments, at the trifling cost of one shilling.

The London Electrical Society, to which Mr. Walker is honorary secretary, has done much towards propagating a knowledge of electrical science, and we hope that the sphere of its action will become daily more and more extended.

Our readers will find some valuable new matter in the present edition; amongst which, we may mention the description of a battery requiring neither acid nor mercury, some new bronzes, observations on mould-making, &c.

We are glad to see that Mr. Walker announces a second part of "Electrotype Manipulation," which will exclusively treat of that attractive branch of the science—the deposition of gold and silver; and containing an account of the several applications of the art.

II. CHEMICAL MANUFACTURES.

REPORT CONCERNING THE FURNACES AND STOVES OF THE MANUFACTORY OF WASSERALFINGEN, WORKED BY GAS.*

BY R. H. SCHOENBERG.

When we endeavour to include in one *coup-d'œil* the progress that has hitherto been made in the manufacture of iron, we feel great satisfaction in reflecting on the success which this important branch of industry has attained, and the wonderful effects which have resulted from the aid it has received from science since the commencement of the present century. The numerous efforts that have been made by the iron-masters and the proprietors of iron-foundries to diminish the expenses of manufacture, by economy in the materials, are remarkable; and most particularly the attempts of every description that have been made to economize fuel.

It is with reference to this object that in blast furnaces and in refinery stoves successive trials have been made of charcoal, coke, of charred wood, coal, and even of anthracite and turf; and that a new mode has thus been introduced of removing the difficulties consequent to the manufacture, and of diminishing the expenses which attend its production. Subsequently were introduced, the application of heated air, the application of the flame from the mouth of the chimney of blast furnaces to various purposes, and an infinity of other valuable inventions.

The most important of all these improvements is, perhaps, the one for which we are indebted to M. de Faber, director of the iron manufactories of Wasseralfingen, in Wurtemberg, who has been successful in his attempts to collect before it issues from the mouth of the chimney, the gas which is generated in blast furnaces, and which forms the flame that thus escapes, and of applying it as a combustible in refinery stoves, and in puddling and reverberatory furnaces.

* *Inventors' Advocate*, No. 110.

The application of the flame issuing from the mouth of the chimney to different purposes, such as heating the air to be forced into the blast furnaces, burning lime, roasting the ore, making coke, heating steam boilers, &c., has been known for seven or eight years; yet in all these cases it has been found impossible to produce with this flame a temperature exceeding red heat, which has imposed limits to this method of application, whilst the method of M. de Faber is calculated to produce the highest temperature that can be required in making iron.

The principal method by which this process is characterized, is the following manner of burning the gas, with the introduction of atmospheric air forced through bellows, and in the ingenious construction of the stoves and furnaces.

The conclusions which have been arrived at after many years' experience may, without exaggeration, be considered wonderful, and the discovery to which we allude has introduced a new era in the manufacture of iron quite as remarkable as that for which practical mechanics is indebted to the steam-engine. At Wasseralfingen there are at the present time three furnaces or stoves, worked only by escaped gas, in active operation. It is to the blast furnace from the south, introduced into this establishment, that the requisite quantity of gas is extracted for heating a refining furnace. The application of this method is very simple, and is effected by introducing a tube to a certain depth into the chimney of the blast furnace. It seems that by this means there is obtained at most one-sixth or a fifth of the total quantity of gas produced, and which escapes from this furnace, and it is certain that, notwithstanding this subtraction, there is scarcely any perceptible diminution in the flame which issues from the mouth of the chimney.

The refining furnace produces about 175 metrical quintals of fine metal weekly, which is always of a beautifully white color, like silver. The method of refining in this gas

furnace is brought to such a high degree of perfection, that the iron always runs from it, in a great degree, decarburetted, and it is freed from all impurities, and, among others, from phosphorus and sulphur. The waste, which in the English refining furnaces worked by coke is never less than from nine to ten per cent.; when the furnace is in good order never exceeds from one to two per cent. Neither must the circumstance be forgotten that the cast-iron passed through the refining furnace usually only consists of fragments from the foundry, which, as is known, contain a considerable quantity of sand adhering to them from the moulds. The whole operation is so well regulated, and all is conducted with so much uniformity, that there is little liability to those miscalculations and losses which are only too common in the refining furnaces generally used. The expences of manual labour are also equally small.

The results of puddling with gas, have not been attended with less satisfactory results. The puddling furnace, which has been constructed at Wasseralfingen, and which is in operation there, uses the same gas as the blast furnaces of the north.

In the chimney of this one, two suction pipes are introduced to a suitable depth; by means of these a sufficient quantity of gas can be collected to keep a puddling furnace and a reverberatory furnace in operation at the same time; but the power of the water-wheel which puts the bellows in action not being sufficiently great, these furnaces can only be kept in operation alternately.

The temperature of the gas puddling stove is, according to the nature of the process, even higher than that of a similar kind of furnace supplied with wood, coal, or turf. The flame is clear and transparent, so that the workman is enabled to command at a single glance all the points in which it is most active. The operation when properly conducted proceeds with perfect regularity and uniformity. In each of these operations from 1·75 to 2 metrical quintals are charged with fine metal previously heated till they are red hot, and in from one hour and three quarters to two hours the bars are ready to be shingled. The waste of fine metal during this process is so trifling, that it has been found on an average not to exceed from 1 to 2 per cent. The quality of the produce is excellent.

One peculiar characteristic of puddling with gas is, that the formation and reduction of the scoriæ goes on at the same time.

The produce of the gas-puddling furnace, amounts weekly to about 125 metrical quintals. The operation in the gas reverberatory furnace, presents also, as in the two preceding cases, very remarkable advantages; yet this operation has not been attended with such important results as those obtained in the refining furnace and puddling stove; for the waste occasioned by the scoriæ in this case is very considerable, since it amounts from 12 to 13 per cent., and sometimes to more. The action of the stove is good, and the temperature sufficiently elevated, so that when no accident occurs, as many as 150 metrical quintals can be submitted to the action of the reverberatory furnace weekly.

After what has been observed, it will be seen that the result of the gas stoves and furnaces of Wasseralfingen, may be considered very satisfactory. According to the preceding data, bar iron of excellent quality can be made with a waste which scarcely exceeds 12 to 15 per cent., and without any expense in the consumption of combustible; or, to speak more correctly by making the application of a combustible, which had hitherto remained useless.

It is difficult at present to estimate the full extent of the important advantages which would result from using the gases which escape from blast furnaces, according to the plan adopted by M. Faber; but it appears certain that this plan unexpectedly opens a vast field of improvement to the iron trade, and that it ought to occupy the serious attention of all who are engaged in this manufacture. Let us hope that, if any prejudices still exist, they will be removed by the great progress that has been made; the numerous and well-authenticated proofs of which do not admit of the least uncertainty with respect to an operation, the advantages of which may have hitherto appeared doubtful, because not sanctioned by experience.

COMPOSITION FOR TAKING IMPRESSIONS OF METALLIC OR PLASTER CASTS TO BE MULTIPLIED BY THE ELECTROTYPE.

To the Editors of the Chemist.

Gentlemen:—

Being one of the many of your readers who have doubtless been engaged in experiments on the new and highly interesting art of electrotype, and having felt greatly mortified at the destruction of very many fine casts in taking wax impressions therefrom, and having arrived at the knowledge of a composition which since its discovery has uniformly proved far superior to anything else recommended for the purpose in works on the subject, I have much pleasure in submitting it to the notice of your readers; it will enable any person to take very perfect impressions from either plaster or metal, however elaborate their workmanship, without in the least injuring the original:—

Mutton suet, previously melted and strained	1¾ oz.
White or virgin wax	1¾ ,,
Spermaceti	½ ,,

Melt together, and use in the same manner as

wax, by first dipping the bottoms only of the casts in boiling water, until the face becomes dull, then quickly tie round the outer edge some stiff cartridge paper or board, and pour in the melted composition. Stir it with a camel's hair brush for a few seconds to disperse any air bubbles that may be formed. Let it stand until it sets, when the paper may be removed, and the impression easily detached.

In using metallic moulds, it is necessary that they should be warmed previous to pouring on the composition.

Trusting this communication will not only give an additional interest to the art, but prove of infinite service to experimentalists,

I am, Gentlemen,
Your's respectfully,
JOHN HORSLEY.

Ryde, I. W.
Sept. 10, 1841.

III. PHARMACY, &c.

ON A NEW SYSTEM OF MEDICAL EDUCATION, GOVERNMENT, AND PRACTICE.

BY CHARLES WATT.

IN conformity with an engagement in the last Number, we proceed to lay before our readers a plan of education, government, and practice, which an experience of more than twenty years, the most extended opportunities of observation of, and reflection on its benefits, and of the sad consequences which arise from that now adopted, have proved is alone calculated to exalt the respectability of the profession, to exterminate ignorance and empyricism from its ranks, and consequently to confer the greatest and most permanent benefits on mankind.

In consequence of this being the period of the meeting of the various medical schools in the kingdom, we have reserved it in order that it might be offered to our subscribers under the most favourable circumstances for circulation.

In teaching the sciences, the following OBJECTS are in the highest degree IMPORTANT —the best method of impressing on the minds of pupils the facts, and the doctrines arising from them, and the employment of a check, by which the professor may be enabled daily to ascertain the attention, conduct, and progress of his pupil; and on the part of the latter, the necessity of constant and progressive study. These important obligations may indeed be said to be equally due from each of these parties to the other, and from both to the public, in relation to whom it is their duty to fulfil them, or to relinquish the engagement.

That these objects however cannot be, and indeed never are, thoroughly accomplished by THE PRACTICE OF LECTURES, has long been my established conviction; and this has been confirmed by the experience of years, during which I have had ample opportunities of witnessing the melancholy effects resulting from adherence to so inefficient and worthless a system.

In these remarks, it is accordingly my duty to point out and to prove that the greatest evils arise from this method of teaching, inasmuch as it gives too wide a scope to the vanity, favoritism, and cupidity of teachers, which, coupled with the distance and reserve between them and the students, is the principal, if not the sole cause, of the ignorance and misconduct of the latter. That these evils abound in our institutions for education is, to their disgrace, admitted on all sides, as well as the urgent necessity for the substitution of some method which may contribute more to the credit of professions, and to the benefit of the public.

Although, in pointing out the errors of the present system, I shall confine my observations to the medical sciences, as being of the most vital and universal importance, they will, nevertheless, apply with equal propriety and force to every branch of knowledge taught by lectures.

Of THE PROFESSORS, I may remark that very few, at the present time, are above a very ordinary and humble rank, as to talent or acquirements. There seems to be in some persons a natural propensity to assume the office of lecturers, preachers, or spouters of science, as affording them the best opportunity for display and notoriety; while, in almost all cases, they present an exhibition only of ignorance, folly, and presumption. Every one, indeed, must have observed the ridiculous

ambition exhibited even by some pupils, after they have attended only one or two courses, and before they have acquired any thing like respectable knowledge, to become lecturers; and this is, in many instances, carried so far as to induce them, in consideration of a small fee for each attendance, to congregate a class, including even women and children, at their mountebank exhibitions; and thus to bring science and its abler professors into ridicule and contempt. I remember one of these assemblies in a place near Shoe Lane, where anatomy and chemistry were the subjects, and the audience (which was far from select) paid some few pence for admission.

Such being the case, it will not be wondered that the ABSENCE OF METHOD in the various departments connected with the study of medicine, should afford sad proof of the defective state of medical education. Can, indeed, anything be better evidence of the worthlessness of such a system, or more plainly demonstrate the necessity of reformation, than the mass of heterogeneous confusion which is delivered to pupils, even by some of those who are accounted the best lecturers, but whose chief object appears to be, to attract attention, by affected oratory, or by the relation of facetious anecdotes? Does not this directly prove, that the teacher feels the facts he delivers to be so destitute of connecting circumstances—so insulated, as to require such aid, in order to give them the remotest chance of impression on the memory? Instead of making their chief object the discovery of a simple, facile, and impressive mode of conveying knowledge, these men, in order to facilitate the remembrance of certain facts, which by their own erroneous system are so placed as to defy recollection, adopt the lazy expedient of introducing stories, cases, and anecdotes, often of the coarsest and most vulgar cast, reflecting only disgrace upon a school of science and the profession with which it is connected. Every one of any standing in the profession, can recollect the anecdotes of the Ahernethies, the Coopers, the Blizards, and the Homes "cum multis aliis;" and at the present time some of the servile herd of imitators of their example garnish their harangues with trash too despicable to be worth quotation; forming a ludicrous contrast with the period when the teachers of the art of medicine boasted in their ranks such illustrious men as Monro, Gregory, Black, John and William Hunter, Barclay, and Davy.

This want of method is the cause of much DISTRACTION AND LOSS OF TIME even to such students as are ardently devoted to, and diligently pursuing, their studies. The irregularity and confusion in the lectures, demonstrations, dissections, &c., are so annoying to the pupil, that he is often driven to the point of altogether quitting the study of them, or, as I have often seen, is subjected in a serious degree to mental distress and excitement. What memory, indeed, even of the most attentive student, however powerful by nature or improved by practice, can retain the facts comprised in a demonstrative lecture of an hour's duration, or even any considerable portion of these facts, supposing them to be far better arranged than they usually are? Would not any one be deemed insane who should attempt to teach by lectures the words of a language? Would he succeed in teaching them, if he made the attempt? No. Neither can any one, by such means, teach with accuracy, though he may deliver, and that faithfully, the whole doctrines of the sciences. This he would do with little or no benefit to the pupil; for it is one thing to deliver, and quite another to receive and retain doctrines. Were it not so, why so many auxiliaries to assist the pupil? The reason is plain: the defect is severely felt, though not acknowledged.

Another, and not less serious evil, in this method of teaching by lectures, is its engendering IDLENESS AND INATTENTION, inasmuch as it does not admit of the pupil being, from the time of his entrance on study, made to commence and throughout continue to work for himself; there being no daily method, by which the professor can detect his inattention, or ascertain his progress, except those trifling and flimsy catechetical trials which are sometimes made, and to which few of those who really know the answers will publicly reply.

From devotion to this long established custom, it may be argued, that by the discontinuance of lectures, we should lose the valuable observations, experience and remarks of many able and enlightened men, who are not otherwise in the habit of giving to the world the results of their labors. This, I reply, is the very reverse of an objection to the system proposed—it proves its higher value; for the opinions

and observations of such men will be far more beneficial and instructive to persons who, by a proper system, have acquired a full and accurate knowledge of the subject treated of, than to such as have, under a bad system, acquired imperfect and limited knowledge. That the observations of persons of great experience and extensive knowledge are very valuable, I by no means deny; but I affirm, that they are so, only when delivered to those who are versed in the bases of the subject upon which they treat, and that in exact proportion to the degree of knowledge possessed by the audience.

So forcibly indeed is this defect felt, though never distinctly noticed, and still less attempted to be removed by a more rational course, that, to make up for omissions, and to furnish a better knowledge of the particular science occupying the attention of the pupil, a certain class of persons reside in, or are attached to the different universities and other institutions of learning (especially where medical science is taught), who are employed and recognized as the regular and indispensable helpers of the students doomed to submit to this unsystematic, imperfect and tedious method, in order to obtain even the very limited knowledge which is but too commonly possessed by them.

The consequent IMMORALITY AND DISSIPATION in which many students indulge, are well known. Young men sent up from remote parts of the country to a city like London, are so dazzled by the show and gaiety of the place, and are so often misled by the more unsteady of the medical students, that, if not very firm in principles and conduct, they are soon drawn into folly and vice which often lead to ruin. It must, therefore, be evident to every one, that parents and friends are strikingly deficient in caution when they entrust their sons, under the plan of instruction at present in use, to the dangers of allurement and bad associates. In what, I would here enquire, consist the chief pursuits and occcupation of by far the greater number of young men sent to gain a knowledge of their profession at the various schools in this country, especially in London? Are they devoted to the study of its different branches, and excited by an enthusiastic ardour and ambition to excel?—That some undoubtedly are, I will not deny; but by far the greater number are the associates of idlers and drunkards, frequenters of theatres, smoking divans, and even gambling houses and brothels. Such is the opportunity and scope for idleness and dissipation, which the present negligent and inefficient course of education affords.

That the CHIEF OBJECT OF MOST OF THE STUDENTS, is to endeavour to pass through their examinations with the least possible trouble, and to obtain that very scanty amount of scientific knowledge which will enable them just to gain their diplomas, at either of those libels upon scientific boards—Apothecaries' Hall or the College of Surgeons—is but too evident. It is consequently a fact, equally notorious and lamentable, that under the present system, their studies are postponed and neglected until the very last moment; when, the period of examination approaches, they, in a state of most pitiable excitation, distraction and fear, seek eagerly for foreign assistance, in order to fit them for the ordeal which they must undergo,—to be, as is often the case, totally rejected, or to go through it with such hair-breadth chance as is not only painful in endurance, but even in contemplation; to which probably, under a proper system, they would have looked forward without pain, and which they would have passed through with honor to themselves and credit to their teachers.

That the method of oral declamation, then, is not only not the best, but the very worst by which a science of facts can be taught, is a truth which no one of the least reflection or experience will deny. For these reasons, it is the duty of all well-wishers of science to use their utmost influence to secure the attainment of that method, by which it may be taught, not preached. To the developement of such a system as will attain this, my effects shall be directed.

Having spoken of the lecturers and lectures, I must now speak of the EXAMINERS. The highly dishonourable and disgraceful system of excluding others from their rank, perpetuated by certain chirurgical aristocrats, makes the whole of their procedure a most contemptible burlesque. This system of electing examiners, the class from which they are chosen, and the situation in which they are placed—being themselves in practice, are highly prejudicial to the independence and honor of the profession and to the interests of society.

From the circumstance of practice being their chief object, their time will not allow them to go into that detail of examination which ought to be instituted; and their having to sit in judgment upon the sons or relatives of their co-practitioners, with whom they are on terms of friendship, gives opportunity for bias and partiality, and places them in a very invidious situation. It is but very lately that some of those who had retired from practice had arrived at a state of incapable senility, and yet retained the office of examiners.

As to THE EXAMINATIONS, the method pursued at the College of Surgeons is even less appropriate than that at Apothecaries' Hall; and most of the members of that board being not only in practice, but teachers, there are by far too many causes of partial, hasty, and inefficient scrutiny into the pupil's acquirements. Of the nature and character of these examinations, it is impossible to speak without the most unqualified disgust, and without feeling it to be a duty to hold up to contempt the whole system, and the illiterate agents who officiate under it as examiners.

It is well known that some examiners have a routine vocabulary of questions which they bring forth on all occasions. Before a pupil goes up for examination, he is often furnished with information of this by fellow students who have preceded him in the same mummery. If it should happen that the examiner has written on any particular subject, that will probably form the topic, as if a childish "*cacoethes scribendi*" on the only subject he is well acquainted with, were still operating in his mind.

By other individuals of this Junto, the questions put are so framed as either actually to tell the pupil the answer, or, on the contrary, to mislead him, at a time when, under a state of high nervous excitement, which always exists on such occasions, he is so confused as to feel uncertain of his knowledge of the question, though, if properly interrogated, he is in fact prepared correctly to reply to it. Thus, if one examiner happen to be present, the interrogation runs thus: "If you open such and such parts, won't you see so and so?" Another may tell him what is partly true, and partly false, in order to elicit his knowledge by a sort of puzzle! If he meet a third party, another train of interrogations may be put, suitable to the fancy of the examiner.

Often the questions to be answered are so totally unconnected with the real objects to which they ought to refer to, that to every reflecting mind, it must be evident, that the teachers want as much, and the system more, reformation than the pupils. When it is stated as a fact that the following question, among numerous others, equally absurd, was very recently put by one of the sages at Apothecaries' Hall, to a young man from the country, no more surely can be wanting to convince the public into what worthless hands are entrusted the guardianship of the education of medical men, and that most important of all charges, the health of the community. The question was, "What are the railings round St. Paul's made of?—"Iron." "What kind of Iron?" "Wrought iron." "What is the difference between that and cast iron?"—"One is iron, the other a carburet of iron." After this specimen of mummery, what is the value to the student of a diploma from such hands? or the degree of protection to society against ignorance on the part of the practitioner?

Though, under such a system, the pupil may congratulate himself upon his escape from rejection and from being made a victim to an erroneous method, he cannot feel any real and permanent satisfaction. That can arise only from a confident knowledge of the subject, and his power to pass through the several examinations—a qualification possessed by few who present themselves at these Boards. There, the "laudari a laudato viro" is indeed little known.

Thus a few desultory and irrelevant questions, put during some twenty minutes or half an hour, to the pupil, entitle him to practise! It may be argued, that if the person examined replies promptly and correctly to any question which *happens* to be put to him, it affords an inference that he is acquainted with the subject generally, and must have applied himself diligently to his profession. That it is *presumptive evidence* of such application and acquirement, must be admitted; but this is not sufficient to entitle him to a licence to practise: it is *proof alone* that can be the foundation of perfect qualification.

Surely, then, such facts (and who dare deny them?) are enough to convince the public of the urgent necessity of reformation in every stage and step of medical education, from the entrance of the pupil on his studies to

his final test of qualification; and this not merely in what relates to the pupil, but to his instructors, and to the whole chain of proceedings, from the idle and noxious method of lectures, to the last farcical climax of examinations. Indeed, no change is worth the slightest trouble, nor will produce the remotest success, except it include a total reformation of the mode of teaching, from the commencement of study to the entrance upon practice.

But the method of determining the knowledge of pupils, is not more disgraceful than the scene which takes place both before the commencement and during the continuance of that farce. With what disgust must every one have witnessed the self-satisfied, easy, careless effrontery, and the cold-blooded, heartless contempt of the feelings of the candidates, displayed by the members of that learned court, styled the "Collegium Regale Chirurgorum," as their elegant Latin title styles their sanctuary; while the feelings of the youthful probationer are either wrought to a state of frenzy, or he is on the point of fainting, as his blanched face and quivering lips too plainly tell—unless indeed he has been dosed with opium or hyoscyamus, as is the common practice. During this agonizing period, the examiners are generally occupied in frivolous conversation with each other and with certain titled members, to whom the lower part of the assembly are very courteous, in order to display the familiar terms existing between them. Viewed indeed, as a body, they are a kind of Star-chamber Inquisition, to attempt to revoke whose decrees would be vain. Their acts admit of no repeal; their decisions admit of no revision; and it is to a change of system, and not of men, that we must apply for the substitution of a better method of education, and for a more rapid advancement of medical science.

(*To be continued.*)

INUTILITY OF THE PHARMACEUTICAL SOCIETY TO COUNTRY DRUGGISTS.

"That the present state of medical education, government, and practice, can no longer be suffered to disgrace the name of science in this country, and that society cannot longer be left unprotected against ignorance, folly, and imposition, nor the educated and enlightened practitioner be cheated of his just rights, and permitted to remain on the same degraded level with the illiterate pretender and fraudulent empyric, must be evident to all who are conversant with the subject, or possessed of common reflection."

Vide *The Chemist*, No. XXI, p. 280.

"The existence of such a body as the untaught tradesmen who arrogate to themselves the title of Chemists, remains, as one of the most amusing absurdities of the nineteenth century."—Vide *Dr. G. O. Rees on the Analysis of Blood and Urine*, p. 10.

To the Editors of The Chemist.

Gentlemen:—

In the last No. of your Magazine there is a letter from Mr. John Fordred of Ashford, on the subject of Medical Reform, and the Pharmaceutical Society; permit me to offer a few remarks on the same subject.

I have viewed with interest the rise and progress of the society above named; I rejoice in its rise, I lament that its progress is not more marked and distinct, and I doubt not that hundreds of my provincial brethren have experienced the same feelings. In the letter which I have mentioned, there are some very trite observations respecting the rates of subscription payable to this society: can it be expected that the druggist living one or two hundred miles from the metropolis, and who therefore cannot possibly take part in the scientific discussions of this body, attend its meetings, or avail himself of the use of its laboratory, or library, will contribute to its funds in the same proportion as those who can reap the full measure of its benefits? Is it just that he should do so? would it be wise on his part? Ask the London druggist which, as a body, he considers the best chemists, the London or the provincial druggists? and see if he will for a moment hesitate to tell you of the advantages which he possesses over his less fortunate brother. I am not desirous of contesting the point, even if the answer proved as I have supposed it would; this I know, the metropolitan druggist already possesses many opportunities of gaining a knowledge of chemistry, which do not exist in the country: whether he uses those opportunities to the extent to which he ought to do, and whether we are able to make up for the absence of them by dint of perseverance and close application, I must leave the impartial to judge; but it must not be expected that we shall uphold a Society from which we cannot obtain our fair share of benefit.

The prospectus of the Pharmaceutical Society of Great Britain, (great name this!) sets forth that the Society "is instituted for the purpose of uniting the Chemists and Druggists into one ostensible, recognised, and independent body; for protecting their general interests, and for the advancement of Pharmacy, by furnishing such a uniform system of education as shall secure to the profession, and the public, the safest and most efficient administration of medicine." It may be well to consider how far it is likely to effect these objects. I am at a loss to know how uniting

the members of this trade into one body can make them either independent or recognised.

It is said that union gives strength: true, it does do so; and in this instance the force of union has been successfully employed, in opposing the various bills brought before parliament, which, while their professed object was to reform the higher walk of medicine, sought to inflict disabilities on the druggist, and rob him of a part of his business. Thus, I freely admit that the Pharmaceutical Society of Great Britain has been of great service in concentrating the strength of the trade, for the purpose of "protecting their general interests;" in this the country druggist has an equal stake with his metropolitan fellow-tradesman, and for which he ought and would willingly contribute an equal subscription, but it cannot be requisite that that subscription should be two guineas, or one guinea, or even a moiety, of that sum per annum.

With respect to the educational objects of the Society, I am at a loss to see what guarantee the public can have as to the extent of chemical knowledge possessed by any individual from the fact of his being entitled to write at the end of his name M.P.S.G.B., when that distinction is obtained by any of us, without regard to qualification, for £2 2s. per annum. Is there not in the educational part of this Society a great resemblance to the Mechanics' Institutes, and Scientific Institutions, of the present day, one or other of which is happily to be found in almost every town throughout the kingdom? Do we look on it as any warranty of a man's possessing mechanical talent, or scientific information, because he is a member of these bodies? Neither would the public be disposed to respect any distinction conferred by a body, not chartered, or recognised, by the Legislature.

Would it not then be far better for the Pharmaceutical Society to abandon their educational project, and restrict their operations to the protection of the trade from the assaults of those who seek to do us wrong, and to become the originators of some bill for the purpose of incorporating the chemists of the united kingdom, enforcing a uniform system of education, and of defining the limits and privileges of the profession? Surely it is better and more creditable to begin the work ourselves, than to let others drag us into some measure of medical reform, wherein we shall perhaps receive just so much notice as is requisite for the purpose of placing us under restrictions and disabilities.

We stand in need of no new establishment for this purpose, the present schools of medicine are sufficient; perhaps the present teachers are sufficient; but the course of chemistry taught to parties intending to qualify themselves for the profession of chemistry, should be more extensive and practical, than that which is now taught the medical student; and is not the present Court of Examiners of Apothecaries' Hall quite sufficient? The first qualification should be the production of articles of apprenticeship, which should have been faithfully served; the fees for lectures should be paid at the time of entrance, and a fee should also be paid to the Hall for certificate at the time of passing.

This plan, or such a one, would possess the advantages of requiring no expensive or cumbersome machinery, for its management; it may be acted on without delay; there requires no outlay for building, &c., &c.; it is calculated to define exactly the limits of the profession, and to wipe away the jealousy which exists in the minds of some apothecaries, towards the present members of the drug trade.

If this plan be objected to, let us take as our model the College of Civil Engineers; except that they fail not to require of candidates that they shall have made themselves practically acquainted with pharmacy, at the counter of some member of the profession.

There doubtless has been a time in the which if the Pharmaceutical Society had been in existence, and its educational objects been fully carried out, it might have saved us from some of the reproach which has been cast upon us: that time is past: we must now adopt more energetic measures; we are assailed from without; let us, therefore, correct whatever is defective within, rather than have the amputating knife used on us by those, many of whom have shewn themselves inimical to our interests.

The apothecary of the present day complains of what he terms the druggists' counter practice; he is jealous because we venture to take upon ourselves the responsibility of prescribing a dose of rhubarb and magnesia, to the child who has eaten too many apples, or an aperient pill and a black draught to the adult: fie on such jealousy!—it can exist only in the minds of the most humble members of the profession; the man of talent should be, and doubtless is, above it. The public is already well protected from any injury at our hands; we are not allowed (under heavy penalties, which would not fail to be exacted) to go out to visit patients; and those who are at all seriously ill will not leave their homes to come to us.

On the paragraph which stands at the head of my letter, and which is from Dr. G. O. Rees' work, it is scarcely worth while to offer any remark; it gives an illustration of the estimation in which the druggists of the present day are held, and I leave those who read it to form their own opinion of its truth, or fallacy; he who can read it without feeling vexed, is possessed of more stoicism than I am.

I am, Gentlemen,
Respectfully yours.
A Country Druggist.

MEDICAL REFORM AS AFFECTS DRUGGISTS.

Edinburgh, Sept. 3, 1841.

To the Editors of The Chemist.

GENTLEMEN :—

Believing your excellent journal to be widely disseminated in this country and in England, I seize the opportunity of so good a medium, to make a few remarks concerning the formation of a society now being firmly established, and to which you are no strangers, namely, the Pharmaceutical Society of Great Britain. I take the liberty of addressing myself to you the more readily, knowing, as I do, the great interest you have always shewn in everything connected with Medical Reform.

I am not aware that your readers in England are acquainted with the circumstance, that here we do not recognize a division (an extensive one with you) of the medical profession, under the name of apothecary. In reality, a surgeon and druggist with us is equivalent to your English apothecary. He atteuds his patient, and sends from his shop his own medicine, either claiming a fee for attendance and medicine, or making the latter pay for both by charging exorbitautly. Such being the case, the profession throughout Scotland is, or ought to be, divided into physician, surgeon, and druggist.

In many country places, the physician acts as surgeon, and *vice versâ* the surgeon as physician, while it is not unfrequent to find the avocations of a druggist added to the duties of the two former. This gives rise in many towns, to the great annoyance of grocers vending medicines; for as the surgeons aim at an exclusive monopoly, they at once deprive a regularly bred druggist from the chance of success, while they encourage the grocer, from demands made upon him by parties, who, though slightly ailing, are unwilling to employ the surgeon and druggist, until they have tried some of the simple drugs to rally them from their illness. We therefore find a man comparatively uneducated, but who may be able to distinguish moist sugar from sand—indigo from starch—or tea from coffee, become at once a person of education possessing power to discriminate betwixt p. sodæ tart. and p. sodæ carb.—betwixt magnes. sulph., zinc sulph., or acid. oxalic, while they seem intuitively to become acquainted with some prosological table, by which they are euabled to distribute doses for all ages and constitutions.

Whether we have the town or country to blame for the introduction of this system, I cannot pretend to say, but I suspect both are in fault. It is notorious that in such towns as Edinburgh and Glasgow, many families supply themselves with senna, salts, castor oil, &c., from grocers. Now, the grocer sells drugs at a corresponding profit to that which accrues from the sale of sugar and other household commodities, forgetting how small the consumption of the one is compared with the other. He seems to vend it as if cream of tartar was ordered by the hundred weight—castor oil by the gallon—or senna leaves by the stone. I wonder how long a hogshead of cream of tartar, a bale of senna, or a dupper of castor oil would last some of those traffickers in drugs? Let them reflect for one moment on the number of hogsheads of sugar and bales of coffee or chests of tea they get through, ere they dispose of 28lb. of some of their drugs. We all know that it is the heavy trade, the continued demand for his articles, which remunerates the grocer, and not the profits on a small amount. There is a continued consumption and demand for the principal part of his stock, which gives him a quick and ready return; but he seems to forget this, and to sell medicine as if every person were bound to add a dose of salts to sweeten his tea, or castor oil to enrich his coffee.

The absurdity of a grocer vending drugs at the present day, is so glaring, that we might as well have the barber practising the art of surgery, which his pole and brass basin, hanging from the door of his small shop, plainly indicate to have been at one time his sole prerogative.

Independent of the injury done to druggists by this practice, we must not forget that it is far from being unattended with danger to the public. From what I can learn, the Pharmaceutical Society will be able ere long to effect some alteration in this system of things, which is at the present time so great a drawback to chemists in every district of Scotland. This being the case, an association such as the one now forming, ought to receive the cordial support and co-operation of all classes of chemists in particular.

It was with much pleasure that I have observed from time to time, notices in your columns from various cities in England, in connection with the Pharmaceutical Society, and have been much pleased with the manly resolutions proposed and seconded in those meetings; and I must candidly state, that while my eye scanned those lines, I had a feeling of regret, nay of shame, when I searched in vain to find some demonstration of a similar kind from Scotland. The Scotch are proverbially a cautious set; they have the name of being considerate, of being niggard, but then they are allowed to be an educated people—educated I mean as a *nation* compared to other countries: whatever may be the individual intellectual capacity of the inhabitants of Scotland, their numerous and well regulated schools, academies and other places of learning, do every thing to foster and bring forth what may lurk within, and though far

from meaning anything invidious in the assertion, the north side of the Tweed has ever been distinguished from the south, by a kind of substantial knowledge, differing from the more superficial attainments of the English. This will make the circumstance to which I allude the more remarkable, namely, that as yet neither in Edinburgh, Glasgow, nor any of the other Scotch towns, has the slightest notice been taken of the exertions of the society in behalf of our rights and privileges. I question indeed if the society can produce a dozen names as members of the association, in Scotland, certainly not half that number from the capital.

At the very beginning of the Society, a great evil, which threatened to break in upon and destroy our rights and privileges, was prevented by the strenuous exertions of the committee, by successfully opposing the obnoxious bill of Mr. Hawes. Thus gallantly commencing their career of warfare, and having as freely unfurled the banner of justice, they at once held out the hand of good fellowship, inviting all chemists to array themselves in the ranks, and to lend their exertions towards defeating those who would have trampled on and crushed them.

No demonstration, even of good will to the cause, has, as yet, been evinced by us northern people, and we shew an inactivity which is most remarkable. Already in Exeter, where there is a population of only about 28,000, in Worcester, where there are 19,000, in Stafford, where there are 7,000, and in many other places, have the druggists had meetings to promote the views of the society as far as they can.

Let us, on the other hand, look for a moment to Scotland, where we have Edinburgh, population of 136,000, famed for its academies; Glasgow, population 290,000, as famed for its university, from which not the slightest good feeling towards this object has emanated. Let us hope, however, that this state of things may soon be changed, for we may rest assured, that however cramped the Pharmaceutical Society may at present appear, it is capable of raising the standard of respectability amongst our trade, and of promoting our real interests. When we contrast our own state as retail chemists with that of our Continental brethren, it well becomes us to hide our "diminished heads," for, generally speaking, they are well educated men, and as a consequence have aided in bringing to light some of our most valuable and brilliant discoveries in that branch of science with which we are so closely connected.

I well recollect being told by a medical friend, that while travelling in Germany, some years ago, he had occasion to enter a chemist's shop; his description of the shop, compared to our own places of business, was ludicrous enough. The place occupied by this dispenser of drugs, resembled externally, a cellar or place of keeping lumber; upon entering, the interior did not belie the exterior, for every thing was thrown about in confusion, while daylight was but scantily supplied by a small window. In addition to this squalid appearance to the eye, the nasal organs were offended by a most unpleasant odour, so much so indeed as to illicit an exclamation of surprise, followed by a query as to the cause of its production. Judge of his astonishment, when told by the chemist who was putting up the little matter he required, that the smell he complained of was occasioned by the continued evaporation of sea water, to produce BROMINE, which at that time had been only recently discovered, and which very likely was even unknown by name to the generality of retail chemists in this country. This circumstance affords a very good illustration of the manner in which our foreign friends cultivate the science of Chemistry.

Before concluding these remarks, I would mention, with respect, the kind exertions of a young gentleman in the west end of London, who has bestowed (I might say lavishly) time and money in the formation of the Pharmaceutical Association. We are all much indebted to him for his great exertions in our behalf, while he is so well known to all those connected with, or interested in the society, that it precludes the necessity of mentioning his name. My anxious wish is, that he may live to have the pleasing reflection of the result of his endeavours in rearing an institution, which I trust may long exist.

I am sure, Gentlemen, that I have quite trespassed upon your patience, but if it prove of the smallest benefit in attracting chemists here to the subject, it will, I have no doubt, gratify you, while it will very much please,

Gentlemen,

Your most obedient servant,

J. MACKAY, M.P.S.

EDUCATION OF DRUGGISTS.

To the Editors of The Chemist.

GENTLEMEN:—

That pharmacy, considered as appertaining either to the arts or sciences, affords as extensive a field for the employment of talent as any other branch of the medical profession, cannot be doubted; a circumstance which should be borne in mind in the proposed Regulations for the education of the chemist and druggist; at the same time there is a necessary division of labour and talent as connected with the pursuits of the chemist and druggist, which should not be lost sight of, amidst the existing diversity of opinion respecting the amount of scientific knowledge it is essential for the chemist and druggist to possess. That division comprises the manufacturing chemist, the operative

and pharmaceutical chemist, the dispensing chemist and retail druggist, or pharmacopolist, and the wholesale druggist—an arrangement, it will be perceived, quite consistent with an efficient administration of medicine, and acknowledged as such by the public, and also by many of the most liberal and enlightened members of the Colleges of Physicians and Surgeons.

It must be admitted that it can scarcely be necessary for all to attain the same standard of information, neither is it indispensable to securing an efficient performance of the duties connected with the various departments, that each in his individual capacity should possess the whole acquirements embraced in the educational scheme of the society, viz. medical botany, chemistry (both practically and theoretically), materia medica, and pharmacy, together with a knowledge of toxicology.

Respectfully yours,

PHARMACOPOLA.

CHEAP DRUGS.

To the Editors of The Chemist.

St. Marylebone, Sept. 1841.

GENTLEMEN :—

You will do great service to the chemist and druggist, and the public at large, by continuing your wholesome strictures on the baneful and very prevalent system of advertising cheap drugs: a practice alike injurious to trade, the progress of pharmacy, and the cultivation of science, and which, at best, can enrich but few, and that few, at the expense of the whole body, the probable loss of character, and the evident subversion of the trade. The pursuit of pharmacy is altogether incompatible with a competition in the sale of drugs, as far as regards price, independent of the consumption or demand being of such a limited nature as, compared with other necessaries, to render an active or cutting opposition the height of absurdity, and which may be appropriately designated, in the language of your former correspondent, "the ingrafting of medicine upon the sugar tub." It is this mercenary spirit, this hankering after the pounds, shillings and pence, which has hitherto kept the art of pharmacy so much in the back ground, aye! more than all the other causes which have been assigned put together, and which I fear will still prove a stumbling-block to its advancement, unless a better spirit of emulation can be instilled into these destructives, through the influence of example or the instrumentality of your powerful pen, backed by the assistance of others equally desirous of promoting the general welfare and the cultivation of science.

Under the above impression, I beg to call your attention, and that of your readers, to the following advertisement, selected as a specimen of the many of similar pretensions that crowd the columns of the daily papers and other periodicals. "Important to Families and Invalids. — Seidlitz powders for 12 draughts, 1s. per box: carbonate soda, 1s. per pound: tartaric acid, 2s.: Turkey rhubarb, 18s.: effervescing lemonade and ginger beer powders for 18 draughts, 1s. 3d. per box: soda water powders, 24 draughts, 1s.: senna leaves, 3s. per pound: Epsom salts, 6d., 3lbs. 1s.: white tasteless castor oil in pound bottles, 2s. 6d. each. None but first-rate articles kept. Goods sent to all parts daily." The name and address you will observe I have omitted, as doubtless this worthy scion of the trade would like to obtain the insertion of his much respected name, coupled with his paltry advertisement, gratis, in your widely circulated columns, and would console himself with the reflection that it would amply repay him for the exposé.*

The disastrous effects of such a proceeding are too evident to require comment; but I cannot conclude without enquiring what must be the disappointment, to say nothing of the disgust, which the noviciate (who has probably paid from £200 to £300 premium to become acquainted with the art and mysteries of pharmacy) will experience on finding he has to compete with such low characters and ruinous prices as those above quoted. Is it to enable him to compete with such grovelling hucksters as these that he is required to attain a classical education, and devote both money and years to the study and acquirement of botany, chemistry, materia medica, and pharmacy, in addition to the other matters and minutiæ connected with the trade of the chemist and druggist.

It is obvious the sale of drugs ought to be ensured to the Pharmacopolist, and at remunerating prices too, especially if he is not allowed to prescribe; otherwise, I ask, how is he to be supported in the prosecution of his art, or by what is he to be maintained whilst engaged in scientific research; he looks to the profit arising from the sale of drugs as compensation for past and future labor, and whilst devoting his time and talents to the pursuits of the laboratory, he relies upon a well-merited, though hard-earned reward, viz., sufficient daily bread wherewith to supply himself and dependants; for little else, as the trade is now abused and constituted, is he able to procure.

Gentlemen, in conclusion, should the truth of these observations attract your attention, I trust you will use your influence, and as the acknowledged champions of the trade, make every exertion to save the once respectable, I had almost said lucrative, calling of

* This respectable individual has two shops, it is to be observed: one north, the other westward.

the Chemist and Druggist from that perdition to which these dastardly, chandler's-shop-begotten aliens would consign it.

I am, Gentlemen,
Very respectfully yours,
PHARMACOPOLA.

A FEW REMARKS ON THE COMPOSITION AND MEDICINAL ACTION OF PROTO-CHLORIDE OF MERCURY.

BY JOHN MACKAY.

THERE is perhaps no simple or compound medicine more generally used than calomel. From the very earliest times it has been employed alike for both sexes and all ages. Few substances are capable of fulfilling so many different indications according to mode of combination as the above. Amidst its extensive employment it is, however, frequently injudiciously administered. It would appear to be thought by the medium and lower classes a panacea for all complaints; if a child be fretful from cutting teeth, or any other cause, —if it has a severe cold, derangement of stomach or bowels, slight fever, eruption, or any other infantile disorder, away the fond mother sends to the "doctor's" for a calomel powder, and no sooner has the little one swallowed the white powder than for a time her every fear is allayed.

There would appear to be a little mystery concerning the derivation of the cognomen given to the preparation above. The most generally received opinion is, that Sir T. de Mayenne, gave it the name of calomel from his servant who prepared it, being black.

At the present time two methods are employed for the production of this salt; one by precipitation, the other by sublimation. The following diagrams will illustrate the change in both cases. The ingredients are taken in their atomic proportions :—

PRECIPITATION.

60 Chloride of sodium	Chlorine	36	86 Nitrate of soda in solution.		236 calomel precipitated.
	Sodium	24			
262 Proto-Nitrate of mercury	Nitric acid	54			
	Oxygen	8			
	Mercury	200			

SUBLIMATION.

272 Bichloride of mercury	Mercury	200	236 Calomel.	
	Chlorine	36		
	Chlorine	36	236 Calomel.	
200 Mercury		200		

Calomel may be much increased in power, and possess effects upon various organs, according to combination. Thus, it may act as a cathartic, as an aperient, as a diaphoretic, as a sialogogue, as an anthelmintic, as an alterative, and is particularly serviceable in all hepatic affections. It is rarely employed alone, although capable of exerting some influence on the bowels, if given in sufficiently large doses. Perhaps the most efficient mode of inducing peristaltic motion, and thus evacuating the intestinal canal, is to combine this salt with ext. colocynth, aloes, or some other purgative. As an adjunct in cases of this description, calomel is invaluable. A hundred and fifty years ago, it was by no means an uncommon practice to exhibit the chloride of mercury alone in doses of ℈j and ʒss. In such quantities calomel would be apt to exert less powerful effect than when exhibited in smaller doses of from six to eight grains, while, on the other hand, it would be less dangerous to the patient than in ten or twelve grain doses.

At first sight it seems paradoxical that children should be able to bear much larger doses of calomel than adults, but this is strictly true. Neither is it so surprising, when we remember the quantity of mucus generally present in the bowels of children, which of course renders them much less susceptible of the immediate action of this compound.

Caution must also be exercised in the exhibition of this medicine. We well know that there are some peculiarities of constitution which prevent the patient taking more than a single dose of any mercurial, without unpleasant results, nay, I have known a person to be salivated by a single dose of calomel. Idiosyncracy has even prevailed to such a great degree, that the odour of ipecacuan has produced violent emesis. When calomel is injudiciously employed, and the administration of it continued for some time, we have very dreadful results. The capillaries, from being kept in a state of great excitement, soon become proportionally depressed, and while in this debilitated state, not unfrequently take on disease, affecting at one time the skin, at another the mucous membranes, or even the bones. There are few complaints more severe than this, and if once fairly seized on a person, none more difficult to overcome, while it takes such deep root in the system, that many a constitution once robust, strong, and healthy, receives a shake, which the remaining years of life are often unable to restore.

In concluding these few remarks I may give a diagram showing at one view the changes

which occur in preparing calomel as ordered by the pharmacopœia :—

300 Mercury		200	236 Calomel.	
120 Chloride of sodium	Chlorine	36		
	Chlorine	36		
	Sodium	48	144 Sulph. of Soda.	236 Calomel..
296 Bi-persulphate of Mercury	Oxygen	16		
	Sulph. acid	80		
	Mercury	200		

The above are placed in an alembic and sublimed. The bi-persulphate of mercury is made by combining the acid and quicksilver, with the aid of heat.

ON THE PROTIODIDE OF IRON AND ITS PREPARATION, WITH FORMULÆ FOR ITS SUCCESSFUL ADMINISTRATION IN CASES OF PHTHISIS PULMONALIS.*

BY DR. DUPASQUIER.

We shall not transcribe the medical considerations which induced Dr. Dupasquier to try the efficacy of protiodide of iron in phthisis, but we may observe, in order to give the following formulæ their due weight, that it seems to result from clinical experiments followed up for six years in the Hotel-Dieu at Lyons, that their application has been attended with very considerable success in the treatment of the invincible malady which they had to contend with.

But it can produce these good effects only when it is completely neutral and in a state of perfect preservation. The solid protiodide of iron of the shops ought to be formed, according to Dr. Dupasquier's investigations, of

Periodide of iron, more or less mixed.
Protiodide of iron, not decomposed.
Sesqui-iodide of iron.
Free iodine.

Now, the latter body, on account of its irritant properties when free, is unfavorable in cases of phthisis. In order to profit by all the advantages attendant on the use of protiodide of iron, M. Dupasquier proposes the following method of using it :—

FORMULÆ.

1st. *Dr. Dupasquier's Normal Solution of Protiodide of Iron.*

R. Iodine..... 10 grammes.
Iron filings.... 20 ,,
Distilled water.. 80 ,,

Dissolve by shaking several times in a matrass held in water heated to 70° or 80° C., but not boiling, in order to avoid the volatilisation of the iodine, which must be left to act on the iron until the liquor is completely decolored. It is in order to render this action more rapid that so great an excess of iron is introduced into the formula.

This preparation should be rapidly filtered, for as soon as it is made, it begins to decompose: "Thus," says Dr. Dupasquier, "practitioners should never prescribe the solution in drops, since it cannot be preserved: neither can it be kept in a draught or drink, for in mixtures of this nature, its alteration is also very prompt." It serves as a basis for the following formulæ :—

2. SYRUP OF PROTIODIDE OF IRON.

R. Normal solution of protiodide of iron ..... 4 grammes.
Colorless and very thick gum syrup .....200 ,,
Syrup of orange flowers.... 50 ,,

Mix thoroughly.

The syrups should be colorless, in order that it may be easy to ascertain whether or not the medicine has undergone any alteration; they should be very concentrated, so that the addition of the solution may not render them too fluid. Every tea-spoonful contains four drops of the solution.

The syrup may be added, but only when about to be used immediately, to milk, gaseous water, barley water, or gruel, &c.

GASEOUS SOLUTION OF PROTIODIDE OF IRON, No. 1.

R. Normal solution of protiodide of iron ..... 1 gramme.
Gaseous water ..... 1 bottle.
Gum syrup..... 80 grammes.

The solution and the syrup are rapidly introduced into a bottle of gaseous water, which is immediately worked and shaken to effect the admixture.

The gaseous waters, Nos. 2, 3, and 4, are prepared in the same way, by adding 2, 3, and 4 grammes of protiodide of iron.

4. MARMALADE OF PROTIODIDE OF IRON.

R. Normal solution of protiodide of iron ..... 15 drops.
Narbonne honey..... 50 grammes.

Mix, and add aromatics, *ad libitum*. One teaspoonful to be taken every twenty-four hours; the quantity of protiodide may be gradually increased.

5. PILLS OF PROTIODIDE OF IRON.

R. Iodine..... 8 grammes.
Iron filings.... 16 ,,
Distilled water.. 25 ,,

* *Journal des Connaissances Medicales*, April 1841.

Prepare in the same way as the normal solution; then filter and pour it into an untinned iron ladle, afterwards adding—

Narbonne honey .. 20 grammes.

Evaporate rapidly to the consistence of a clear syrup, and form a mass with—

Gum tragacanth in powder.... 12 grammes.

Make 200 pills, each of which is equal to 4 drops of the normal solution. When these pills are properly prepared and well kept, they ought, on being divided into thin layers, to appear colorless and slightly translucid. "They may," says Dr. Dupasquier, "advantageously be used instead of Vallet and Bland's pills, in the treatment of chlorosis."

6. CAKES OF PROTIODIDE OF IRON.

R. Normal solution of protiodide of iron ..... 20 grammes.

Paste of marshmallow cakes. Q. S. To make 200 cakes,

The solution must be heated in an iron ladle with 30 grammes of sugar, until the mixture acquires the consistence of baked sugar; it is then rapidly incorporated with the paste, and cakes are formed, which should be transparent.

7. JELLY OF PROTIODIDE OF IRON.

R. Normal solution of protiodide of iron ..... 30 drops.

Lichen jelly ..... 100 grammes.

Add the solution to the jelly while liquid, and put it into a cool place to acquire a proper consistence.

8. GLYSTER OF PROTIODIDE OF IRON.

R. Normal solution of protiodide of iron .....15 to 20 drops.

Rather viscous solution of gum arabic ..... 3 pints.

For two injections: one in the morning, the other in the evening.

If these injections cannot be borne, or if they cause too great irritation, from three to ten drops of Rousseau's laudanum must be added.

Whatever mode of administration may be adopted, the normal solution, given first in the dose of 15 drops *per diem*, may be gradually raised to 120 drops in 24 hours.

Dr. Dupasquier associated with this treatment, the employment of tonics, such as Bordeaux wine, Hoffmann's visceral elixir, wine of quinquina, and a strengthening regimen.

To obtain good results, this treatment must be persevered in. Diarrhœa, slight gastric irritation, should not cause its discontinuance. Its use should be suspended only when the oppression becomes very great, and when suffocation is threatened.

MANNA CONTAINING COPPER.*

BY DR. TROEST, GENERAL SUPERVISOR OF APOTHECARIES IN THE DUCHY OF BADEN.

Some time ago manna was brought into sale, marked with spots of verdegris, which indicated its containing copper. It appears to have derived this from being collected in copper vessels. Copper was readily detected by dissolving the ashes of manna in the acids, testing with prussiate of potash, polished iron, hydrosulphuret of ammonia. The presence of copper in manna had, according to Gmelin (*Annalen*, Band xxxiv.), been formally detected by some apothecaries. This impure manna has been withdrawn from commerce in Baden.

* *Annalen der Chimie und Pharmacie*, Feb. 1841; and the *Lond. and Edin. Journal of Medical Science*, No. ix., Sept. 1841.

BOOKS RECEIVED.

"The Oily Acids; forming the first Supplement to the Seventh Edition of Dr. Turner's Chemistry. By Justus Liebig, M.D. and William Grigory, M.D." London: Taylor and Walton, Upper Gower Street.

"Lectures on Chemistry, including its applications in the Arts. By Henry M. Noad, Lecturer on Chemistry." London: R. Hastings, Carey Street; Scott, Webster and Geary, Charter House Square. No. IV.

[We regret being unable to review these works in our present number; we shall do so in our next.]

TO CORRESPONDENTS.

A Subscriber, Cardiff.—That is a matter in which every one must judge for himself; we are doubtful of the utility at so great a distance.

G. O. G.—We think not.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

Advertisers are again reminded of the value of the cover of The Chemist *for all Works, and other Advertisements connected in any way with the Medical and Pharmaceutical Professions.*

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THE CHEMIST.

I. CHEMISTRY.

INVESTIGATIONS CONCERNING URANIUM.*

BY M. EUGENE PELIGOT.

In pursuing the investigations which I undertook concerning uranium, I have arrived at important and unexpected results, which I hasten to communicate to the Academy.

The chemists who have made known the properties of this body, have admitted that the preparation of the free metal is not difficult: indeed, they have given several processes for procuring it: by treating oxide of uranium with charcoal, Bucholz obtained this metal under the form of a grey mass, endowed with a slight metallic lustre: by reducing the same oxide at a gentle heat, by hydrogen, there remains, according to Arfwedson, a brown powder, oxidising in the air, with ignition: the same chemist, with the view of proving that this powder was indeed formed of metallic uranium, endeavoured to obtain the same body by treating with hydrogen a compound which does not contain oxygen,—the double chloride of uranium and potassium: the metal, thus reduced, was presented, after the solution of the chloride of potassium by water, under the form of regular octohedral crystals, endowed with a metallic appearance similar to that of steel. Finally, Berzelius, by heating neutral oxalate of uranium in close vessels, likewise obtained this metal in the free state: the celebrated Swedish chemist considers uranium as one of the most easily prepared metals.

The experiments which I am about to describe, lead to a very different conclusion: it results, indeed, from my investigations,

1st. That uranium is not a simple body, an element, as is at present admitted: this pretended metal contains a large proportion of oxygen:

2d. That the radical of uranium, the true metal, which I have obtained in the free state, presents characters very distinct from those of the present metallic uranium:

3d. That the binary compound which is considered as metallic uranium is a well-defined body, and really acts, in most of the combinations which it forms, the part of a simple body —of an ordinary metal.

In a word, if my experiments are accurate, uranium is a compound metal.

The novelty of these assertions compels me to adduce all the proofs furnished as well by the facts which I have observed, as by those which result from investigations prior to mine.

The action of chlorine on uranium and on its oxides was the point of departure for the new way in which I found myself engaged.

When a current of dry chlorine is passed over these bodies submitted to a red heat, a yellow compound is formed, which is very fusible, very soluble in water, and furnishes by its contact with that liquid a solution which presents all the reactions of the well-known yellow salts furnished by peroxide of uranium: but the action of chlorine is never complete; however long it may be maintained, there always remains a certain quantity of unattacked matter.

Feeling persuaded, at first, that this imperfect reaction was owing to a defect of contact arising from the fusibility of the product formed, which protects from the ulterior action of the chlorine the particles which it covers, I tried this action on oxide of uranium divided by means of charcoal: I was then greatly surprised at obtaining, instead of yellow chloride, a volatile compound, crystallising by sublimation in fine regular octohedral crystals, of a very deep green, endowed with a kind of metallic lustre: this chloride has a great affinity for water, which it evidently decomposes: it furnishes with that liquid a solution of a very deep green, presenting all the different reactions attributed to the salts of protoxide of uranium: these reactions are, consequently, in manifest opposition to the circumstances of the formation of this chloride.

The analysis of this compound presented a

* *Comptes Rendus de l'Académie des Sciences*: No. 8, Aug. 23, 1841.

peculiarity which threw a light on the true nature of uranium.

By treating a certain quantity of it with water, and by pouring into the solution ammonia in excess, the brown precipitate was obtained, which is regarded as formed of hydrated protoxide of uranium: strongly calcined after having been treated by nitric acid, it allowed of my calculating the real weight of the uranium from the quantity of oxygen which it lost under the influence of the hydrogen.

The ascertaining of the quantity of chlorine contained in this compound does not present any difficulty, and is done, as usual, in the state of chloride of silver. In calculating the composition of this body, according to the data admitted by all chemists, it was found that 100 parts furnish 37 parts of chlorine, and 73 parts of protoxide of uranium, which represent about 71 parts of metallic uranium; in other terms, I found that 130 parts of this body yielded 108 parts of these constituent elements, when its elements are brought, by known processes, to a state of isolation.

In the presence of this result, and after having, as may be thought, established the reality and the uniformity of the numbers which I have just mentioned by frequently repeated analyses, it must be admitted that water, in acting on the green chloride of uranium, is decomposed in such a manner that it yields to its metallic radical a certain quantity of oxygen, which the reductive bodies, the hydrogen and charcoal, cannot remove from it; it must be admitted, as a consequence, that this oxygen necessarily exists in uranium, obtained by either hydrogen or charcoal.

The experiment which I am about to relate will show what foundation there is for this hypothesis.

Protoxide of uranium was prepared by strongly calcining perfectly pure nitrate of uranium; the protoxide obtained having been intimately mixed with half its weight of calcined lamp-black, the mixture was submitted, first to a high temperature, then to a current of hydrogen maintained for a long time; as the oxide of uranium, by its calcination with the charcoal, had already lost all the oxygen which the hydrogen had removed from it, no water was disengaged: I had, therefore, doubly realised the best circumstances for acting with chlorine on a mixture of metallic uranium and charcoal: now, from this action exerted by dry and pure chlorine, and carried on in the same tube as had been used in the treatment of the metal and charcoal by hydrogen, there resulted an abundant and complete sublimation of crystallised green chloride, while the collected gases were a mixture of carbonic acid and oxide of carbon; the oxygen of these gases evidently arose, therefore, from the uranium at present regarded as a simple body.

Moreover, no direct experiment having proved the identity of the pulverulent and dull uranium, obtained by charcoal and hydrogen, with the crystallised body with shining facets which results from the decomposition of the double chloride of uranium and potassium, I submitted to the action of chlorine a mixture of charcoal and uranium, obtained by the latter process; the results were the same; the green chloride was formed at the same time as the mixture of carbonic acid and oxide of carbon.

It evidently results, therefore, that the present metallic uranium contains oxygen: it constitutes an oxide of the same nature as the oxides of aluminum magnesium, &c., which are, like it, undecomposable by the isolated action of hydrogen, carbon, and chlorine, while the simultaneous action of the two latter bodies effects the separation of the metallic radical which combines with the chlorine, while its oxygen goes to the carbon.

This fact once established, it became easy to shew that, after all, its physical and chemical properties were, indeed, scarcely those of a true metal. The metallic lustre which it sometimes possesses is rather that of an oxide than that of a metal; for its dust is dull like that of all oxides: although it forms numerous salts endowed with all the properties of ordinary metallic salts, no metal displaces it from its solutions: its specific heat is not in accordance with its atomic weight; its atomic weight, the highest of all known bodies, is by no means borne out by its general characters: put in contact with metals, it does not form alloys: chlorine attacks it but incompletely; sulphur does not exert a direct action on it, while the sulphuret of uranium is produced, according to H. Rose, by the action of the sulphuret of carbon on the oxide of uranium. The formation of sulphuret of uranium under this circumstance, would be one more proof, if required, of the existence of uranium as an oxidised compound.

These anomalies presented by uranium should not have escaped the attention of any chemist: it was they that made me hasten to take the opportunity of studying this body; it was they that lately led Berzelius to distil potassium over uranium: knowing that science had not long to wait for more accurate information concerning uranium, I learnt with some satisfaction that this experiment had given only a negative result.

But uranium being considered as an oxide, differs from all other known oxides by its very remarkable property of combining integrally with several metalloïds as a simple body would do; moreover, it forms, in combining with oxygen, an oxide acting the part of a base and forming salts which correspond, as I shall show further on, with the salts formed by oxides which contain one equivalent of oxygen and one equivalent of metal: the metallic

radical of the present uranium, combined with the proportion of oxygen which it retains under the influence of carbon and hydrogen, acts then in the same manner as a simple body: I shall propose for this compound radical, the name of *urania*, henceforth designating by the name of *uranium*, the true simple body, or at least, the undecomposed body, which exists in combination with chlorine, forming the green chloride, and in combination with oxygen, to form *uranía*.

For the remainder of this memoir I will employ these two names with the signification I have indicated.

The existence of urania as a compound body being demonstrated, I endeavoured to isolate its metallic radical, and though the attempts to decompose urania by other metals were fruitless, I was able to prepare uranium by decomposing its green chloride by potassium; it is known that by aid of the latter metal and chlorides, metals are obtained which cannot be isolated by other processes.

Two parts of chloride of uranium and one part of potassium, are heated in a small platinum crucible: the affinity of the chloride of uranium for water and that of potassium for oxygen, render it necessary that the experiment be made with rapidity; the action should be very brisk. The crucible and its cover should be fastened together by means of metallic wires.

Under the influence of a very gentle heat, such as that of a spirit lamp, the action is set up; it takes place with such intensity that the crucible becomes quite incandescent, and that a portion of the products may be volatilised by the very high temperature which is developed: it is even advisable, in order to preserve the operator from the attack of the inflamed potassium, to place the small platinum crucible in a larger one: it is also necessary to remove the spirit lamp which heats the crucible at the moment when the action begins to manifest itself, except afterwards to heat it strongly, either to volatilise the potassium, or to give more cohesion to the uranium formed.

By treating the products of this reaction with cold water, the chloride of potassium is dissolved, and the uranium is obtained.

The metal thus prepared is partly in the state of a black powder, and partly agglomerated: by carefully detaching the portions which adhere to the sides of the crucible, small plates are obtained possessing a metallic lustre similar to that of silver, which may be filed, and which appear to have a certain degree of malleability; it is evident that these metallic portions have undergone during the reaction, the commencement of fusion.

Uranium is very combustible; when it is dry, it burns in the air with great brilliancy: when a paper containing some pieces of this metal is subjected to the action of heat, they are seen to burn with a very brilliant white light before the paper itself takes fire. If a dry filter, on which uranium is collected, be shaken near the flame of a taper, the light particles which are detached, appear like brilliant sparks in the heated atmosphere which surrounds the flame.

I do not think that this metal decomposes water at the ordinary temperature, for it appears to exist a long time in the air without undergoing any very sensible alteration; however, when water is poured upon the product of the reaction of potassium on the chloride of uranium, there is a very abundant disengagement of hydrogen, which is attributable, in my opinion, to the decomposition, by water, of an alloy of potassium and uraniaum.

Uranium dissolves in acids diluted with water, with a disengagement of hydrogen; these solutions are green, and present the characters hitherto attributed to the salts of the protoxide of urania.

It combines with chlorine with a great disengagement of heat and light, producing the green chloride.

It also combines with sulphur, in a direct manner, at the boiling temperature of the latter body: the action is accompanied by a disengagement of light.

By this brief exposition, it is shown that the properties of uranium are very distinct from those of urania.

Urania, indeed, is not fusible: in the state of crystalline bracteæ, it is of a greyish black, and very brittle. The light which accompanies its peroxidation, is scarcely visible; it is not attacked by the dilute acids; it with difficulty combines with chlorine, giving a yellow compound; finally, sulphur has no action on it at any temperature.

The atomic weight of uranium is easily deduced from the analysis of the green chloride; it agrees with that of urania, which I deduced from the saline compounds formed by the peroxide of urania.

Indeed, considering this chloride as formed of two atoms or of one equivalent of chlorine and one atom of uranium, we have, according to the proportion of chlorine—

Cl^2	442·6	37·1
U	750·0	62·9
	1192·6	100·0

The atomic weight of uranium would therefore be 750.

The green chloride of uranium corresponds to the oxide of uranium, which constitutes urania: decomposed by water, it is converted into hydro-chloric acid and urania; by virtue of this equation:

$$Cl^2\,U + H^2\,O = Cl^2\,H^2 + U\,O.$$

100 of green chloride should produce 71·4 of urania, and 37·0 of chlorine; that is to say, 108·4 of products extracted from this chloride, and 111·5 if the urania obtained is

oxidised by nitric acid, and is brought after strong calcination, to the state of protoxide.

The analyses which I made of this green chloride, have constantly furnished these numbers with very great approximation.

Two atoms of uranium, combined with two atoms of oxygen, represent one equivalent of urania.

This equivalent, as shown by the analyses of the acetate and nitrate of urania, which I communicated to the Academy some months since, and to which I shall very soon recur, is represented, at least, in an approximative manner, by 1700 :—

U^2	750	x 2 =	1500
O^2	100	x 2 =	200
			1700

consequently, 100 of uranium are combined with 13·3 of oxygen, to form urania.

Urania, in its turn, combines with oxygen in several proportions; it is at present admitted that this body forms two oxides. I think I can show that uranium forms at least five combinations with oxygen.

The compound containing least oxygen is obtained by means of an entirely new reaction.

When a current of hydrogen is passed over green chloride of uranium heated to redness, a portion of its chlorine is removed, and a brown compound, crystallized in very fine prisms, is obtained, which yields with water a purple solution, but which very soon becomes green. This chloride, according to my analyses, contains about 30 of chlorine: it is a sub-chloride of uranium, the composition of which is represented by this formula :—

Cl^3	663·9	30·7
U^2	1500·0	69·3
	2163·9	100·0

the sub-oxide of uranium which is formed when this body is put in contact with water has so great an affinity for oxygen, that it decomposes that liquid at the common temperature, with a disengagement of hydrogen gas; it becomes green, because it is converted into urania.

This disengagement of hydrogen is especially very abundant when the purple solution is put in contact with ammonia: a precipitate of a pear-green color is then obtained, at the same time as the liquor becomes effervescent on account of the escape of the hydrogen: gradually the tint of the precipitate modifies, turns deeper, and finally becomes brown, when the conversion of this sub-oxide of uranium into urania is finished: besides, it is remarked that from the solution of this chloride by water a red powder is precipitated, which is probably urania, whose formation should, according to the formula of this compound, be made at the expence of the oxygen of the air.

Although the existence of this suboxide of uranium cannot be doubted, it does not appear possible to isolate it on account of its great affinity for oxygen: of all the oxides known, it is, I think, the only one that decomposes water at the ordinary temperature.

Protoxide of uranium is obtained, by subjecting the nitrate to a high temperature; according to Berzelius, it should contain 100 of uranium and 3·6 of oxygen; its formula would be—

$$(U^2\,O^2) + O\tfrac{1}{2},$$

if, as I think, the composition assigned to it is only approximative. I can also demonstrate that this oxide does not enter into the composition of the green salts, as was hitherto admitted: the green salts contain, not an oxide of urania, but urania itself, acting as a basic oxide.

I have observed, that on heating to dull redness this oxide, which is black, or indeed urania, in a current of oxygen, or even in the air, it assumes an olive-green color, and absorbs about one per cent. of oxygen; it then presents the character of a saline oxide, of the nature of magnetic oxide of iron, formed by the combination of protoxide of urania with the peroxide. I have not yet finished the examination of this oxide.

As to the peroxide of urania, it is known that no process yields it in an isolated state; but this oxide, the most important of all, constitutes the most easily produced salts of urania, the yellow ones, which, for the most part, crystallize with remarkable regularity.

According to the analysis of these salts, this oxide contains one equivalent of urania, and one equivalent of oxygen: its formula is, therefore,

$$(U^2\,O^2) + O.$$

This oxide corresponds also with the yellow chloride of urania, which is obtained by treating urania by dry chlorine; the composition of this chloride, according to my analyses, is represented by—

$$(U^2\,O^2) + Cl^2.$$

The existence of this chloride of oxide of uranium, that of the double combinations which it forms with the chlorides of sodium and ammonium, the composition of the simple and double salts in which the peroxide of urania replaces the bases formed by one equivalent of metal and one equivalent of oxygen, compel us to consider this oxide of uranium, as holding the place of a simple body in all these saline compounds.

In order to show the necessity of thus looking upon the part acted by urania, it will be sufficient, perhaps, here to detail the formulæ of several of its salts, which I have analysed; the discussion of these formulæ, and the preparation and properties of these bodies, will find their place in the conclusion of my investigations concerning urania :—

Acetate of urania	$C^8 H^6 O^3, (U^2 O^2) O, 2 H^2 O$;
Nitrate	$N^2 O^5, (U^2 O^2) O, 6 H^2 O$;
Double sulphate of urania and potassa	$So^3 Ko^4, So^3 (U^2 O^2) O, 2 H^2 O$;
Uranite of Autun	$Ph^2 O^5, 2 (U^2 O^2) O, Ca O, 8 H^2 O$;
Double chloride of urania and potassium	$Cl^2, K, Cl^2 (U^2 O^2) 2 H^2 O$;
Double chloride of urania and ammonia	$Cl^2 N^2 H^6, Cl^2 (U^2 O^2), 2 H^2 O$;

It is evident that if we consider the salts of urania, as formed by an ordinary metallic sesqui-oxide, the salts which are evidently neutral in their properties, such as the acetate and nitrate of urania, should become basic salts: the neutral sulphate of potassa should be combined in the double salt, with a sub-sulphate of urania; the uranite of Autun, whose composition henceforth becomes so simple by admitting the action of urania as a compound radical, since the composition corresponds with that of ordinary phosphate of soda, would present, in the other hypothesis, the most anomalous constitution: finally, the double chlorides would contain an oxychloride combined with ordinary metallic chlorides. In a word, these various salts would combine the most improbable compositions, I might almost say, the most impossible that could be imagined.

Thus, and without even insisting on this fact, which is not, however, without its value in this discussion, *that urania, a compound body, has hitherto been looked upon as a simple one*, I think that this metallic oxide ought henceforth to be classed among compound radicals, such as cyanogen, ammonium, and binoxide of nitrogen: ulterior observations will prove, without doubt, that other oxides are similarly circumstanced.

Such are the brief observations concerning uranium which I had to communicate to the Academy: it is my intention to continue the study of all the compounds of uranium which I can produce; I have, besides, to conclude the analytical work on the salts of urania, which I commenced some months since: in publishing it, I will show whether the numerical data which I have employed in the work I am going to submit to the Academy, may be considered as definitive, or as presenting mere approximations.

ON THE WATERS OF THE PARISH OF HALIFAX.

BY JOHN S. HILEY, M.B.

I APPROACH this subject with that sort of pleasure which a school-boy experiences on peeping into a newly discovered bird's-nest; or perhaps, more properly speaking, with the thrill of delight, which one feels on visiting an old friend, because it is a department in which I have long taken great interest, constituting, as it does, one of the most characteristic features of this neighbourhood. When we consider the superficial extent of the parish of Halifax, and know that it occupies upwards of 75,740 English statute acres, both the chemist, the geologist, and the statistic must necessarily feel desirous to be rendered familiar with the supply and nature of its springs and streams. These furnish an important addition to every country, and attach that to its topographical history, which it is always proper to understand. In offering, then, to the readers of "THE CHEMIST," a succinct account of the nature of the waters of this parish, I must set out by premising that I will not enter so far into the minutiæ of the subject, as to render the contribution either prosy or tedious. I hope, however, to be borne with while particularizing facts which I may conceive to have some bearing on the question in hand, and which may assist in its better elucidation.

It is a well-authenticated truth, that every hilly and mountainous country abounds in a larger supply of rivers, streams, and springs, than those localities which have a flatter aspect. This district is of the former character, the wildest mountains and moors constituting a notable division of its superficial extent. It is separated from the county of Lancaster by that long line of hills called Blackstone Edge, and by some writers, not inaptly styled the "Back-bone of England."

Amongst these ridges, which are crowned with freestone, many of the rivers and streams which glide down the different fertile valleys take their rise. In addition to the lofty mountains just mentioned, the entire parish would seem to be composed of hill and dale of minor character, amongst which springs of water may be seen oozing out in every direction, and either forming numerous wells for the supply of the adjoining hamlets, or small streamlets which, after meandering for a considerable distance, unite their waters for the formation of broader currents. The great river, however, which runs through this district, and by which it is materially benefited, is the Calder. In fact, the parish of Halifax may in some respects be considered the valley of the East Calder with its numerous branches for the first 18 miles of its course.

In consequence of the almost inaccessible nature of the country through which this river passes, its source, and the origin of its name were for a long time involved in obscurity. According to Dr. Whittaker, in whose opinion I repose great confidence, the word is simply the Danish adjective Kalder, *frigidus*. With its source, the patient researches of more re-

cent travellers in the moorlands have made us comparatively speaking intimate. According to the statements of those who have visited the neighbourhood, the river in question takes its rise in a marsh in Claviger Dean, in the adjoining parish of Whalley, where anciently stood a cross of considerable sanctity, at which pilgrims paid their devotions. In this point, several springs first manifest themselves, and immediately join to form the East and West Calders, which, according as the springs are situated to the east or west of this wild and lofty ridge, run to the eastern and western seas.

The hills constituting this tempestuous and barren region form, as I before stated, what has been called the Back-bone of England, westward of which, the West Calder flows, and after joining the Ribble in Lancashire, enters the Irish Sea. The East Calder, pursuing an easterly direction, after entering the parish of Halifax, flows through the township of Todmorden, and in its course passes down one of the grandest and most romantic valleys in the kingdom, where the scenery partakes more of the character of the highlands of Scotland and Switzerland, than most other places which it has been the lot of the traveller to visit. So narrow is this mountain gorge or valley in some places, the precipices, several of which are more than one hundred yards in perpendicular height, approaching so close, that the canal, the river, the road, and the railway intersect or pass within a few feet of each other. In a word, this valley in every respect, resembles a vast chasm, which has been formed by the sudden separation of its sides, or as if opened by some extraordinary flood.

After winding by several populous hamlets, the river reaches Sowerby-bridge, within two miles of the town of Halifax. From this place it proceeds by Salterhebble, Elland, Brighouse, and Kirklees Park, in the vicinity of which it receives the Colne from the parish of Huddersfield, and, passing onwards by Mirfield, Dewsbury, and Wakefield, reaches Castleford, a village about 3 miles north-west of Pontefract, near to which, it unites its placid waters with those of the more magnificent Aire.

From one to whom the course of this noble river has for a long season been a source of admiration, a passage or two in praise of the scenery connected with it, I am sure will be acceptable. Throughout the whole of this course, the river, particularly in the neighbourhood of Elland, can boast of numerous and almost unparalleled beauties. Along its embankments, where manufacture has not reared its head, the willow, the birch, and the hazel flourish in all their luxuriance, and thus materially add to the beauties of a landscape in many respects unequalled. At a short distance to the right and left of the Calder, along an important part of its route, the ground becomes considerably elevated, and both sides of the valley thus formed, are hung with woods of native oak, not, indeed, of a majestic character, but sufficiently so to have merited the admiration of all who have visited the spot. From the summit of the eminences on either side of the river, we have an extensive view of the stream and the country adjoining, so varied in its character, that we may observe with Kirke White—

> "Above, below, where'er I turn my eyes,
> Rocks, waters, woods, in grand succession rise."

When we regard the route of this enchanting river, it will be at once perceived how important a position it occupies amongst the waters of the parish. And this statement will appear more satisfactory, when I add that perhaps no similar-sized locality in the kingdom can be found, in which are so many other brooks and streams all tributary to the Calder. These amount to nine in number. The first rivulet, to which I cannot ascertain that any name has been affixed, rises in the wild township of Stansfield, and after running between this and Heptonstall, empties itself into the Calder at Mytholm. The second, termed Hebden, or Hepton, rises in the mountains of Heptonstall, and flowing between this and the township of Wadsworth, joins the Calder at Hebden-bridge. The third takes its rise near Blackstone Edge, and after passing through the wild vale of Turvin, and partly separating the townships of Sowerby and Erringden, unites its waters with those of the Calder near Mytholm-royd Bridge. The fourth is a stream from Luddenden, which passing between the townships of Midgeley and Warley, forms a confluence with the Calder at Luddenden-foot. The fifth, the Riburn, which runs into the Calder at Sowerby-bridge. The sixth, the Hebble, formed by the junction of two other streams in Ovenden, which after running and separating the town of Halifax from the townships of North and South Owram, falls into the Calder at Brooksmouth. The seventh is the stream termed Black-brook, or Blackburn, above Elland. This rises in the adjoining parish of Huddersfield, and after winding between the townships of Stainland and Barkisland, empties itself into the Calder near Clayhouse. The eighth is the Red-Beck, which is first seen in North Owram. From this place it courses along, dividing this township from South Owram, and joins the Calder at a place called Brook-foot, below Elland. The ninth is the Clifton Beck. This takes its rise in Shelf, and separates this township from the neighbouring parish of Hartishead, and, after pursuing a somewhat protracted course, joins the Calder near Brighouse.

Well-watered as the country may be by the Calder and its nine tributary streams, there

are several other still smaller rivulets, to which, however I need not allude. The waters of the first, in consequence of the mills and dyeing-houses which throng most of their embankments, are not always very pure, though some of them, particularly the Calder and Hepton, abound in excellent trout and other fish. In seasons of floods, during which the rain on the surrounding hills, as Boothdean, Blackstone-edge, &c., is generally immense, their waters are so much swollen as in most instances, not only to fill their channels, but likewise to overflow their banks. Scarce a year elapses that the Calder and canal, even where they are widest asunder, do not unite, and this generally occurs in the spring and autumn, about April and November, when the rain is nearly incessant. In the neighbourhood of Elland, the Calder in several points is upwards of 100 yards or more from the canal, and yet I have repeatedly seen the fields between them covered with water to a moderate depth, so that boats have floated from the one towards the other.

A better idea, however, will be formed of the sort of floods which have occurred in this parish by mentioning what has been termed the Ripponden flood. This great inundation happened on the 18th of May, 1722, and it bears ample testimony to all that I have just recounted. Between the hours of three and five in the afternoon, the water in this fertile valley is said to have risen seven yards perpendicular, and to have borne down in its course several bridges, mills, and a number of houses. Many persons also lost their lives on this melancholy occasion. The church was much damaged, part of the church-yard washed away, the graves laid open, and a coffin was lodged in a tree at a considerable distance. It may be observed that this beautiful village occupies a deep recess amongst lofty hills.

On these and similar occasions, the waters of all the streams become extremely muddy, and it is surprising how large a portion of sand, stones, wood, &c., the current will bring along with it. Several of the rivers drain the sandstone formations, others, the mining districts and the coal strata, for which reason these are amply charged with peroxide of iron, whilst the third would seem to receive the waters from the stratified depositions lying nearer the surface.

There are no lakes or pools in the parish. If they ever existed, as there is some reason to believe, they have been long since drained, and converted into valuable land. The moors, however, are not exempt from marshes, morasses, and peat bogs, amongst which there seems to be an abundance of decayed and decaying vegetable matter, in some places amounting to more than four feet in depth. Much turf is annually extracted.

Having thus treated of the running stream in as clear and comprehensive a manner as the nature of the subject would permit, I will now direct my attention in the second place, to the springs, whether simple or mineral, which exist here. I term them simple, because they are not charged with any of those matters, as iron, sulphuretted hydrogen, &c., which usually go to constitute mineral waters, and because they are generally used for all household purposes. This division of my subject will doubtless interest many of your readers, and though it does not come within the sphere of my present design to enter very minutely into the number, &c., of the springs, yet I shall enlarge somewhat on their qualities, properties, and sources.

The whole country is rich in simple waters, which, as is customary, divide themselves into the hard and soft. In addition to these, there are divers mineral waters of a sulphureous, chalybeate or carbonated character, all of which have from time to time been applied with immense advantage in the instances of those whose circumstances would not admit of their visiting the more celebrated watering-places. These will be more fully described afterwards.

The nature of the ordinary springs will be readily conceived by studying the geological relations of collieries, specified in my letter inserted in your last No., for it will at once be seen that the compounds therein contained must he common to a considerable portion of the parish. I may just recapitulate, that salts of potash and soda, gypsum, magnesia, alumina, iron, &c., are all encountered in one or other of the formations, and as such impart a stamp to the numerous springs. The formations alluded to are clay, shale, argillaceous rock, intermingled with marl, lime, magnesia, and iron, the carboniferous system, shale, grit, and sometimes limestone, and lastly, the old red sandstone. According to the absence or presence of any of these, so will the nature of a spring be altered. If the fluid have filtered through quartzy strata alone, where neither gypsum nor saline substances were present, then it is pure and soft, and being impregnated, as most waters usually are, with more or less oxygen and carbonic acid, it is gifted with a most delicious flavour, and is highly enjoyed as a drink. The carbonic acid divests it of that insipidity and nauseousness peculiar to water which has been previously boiled. Should the water have percolated strata containing limestone or gypsum, &c., then it dissolves more or less of these salts, and at once acquires the property of hardness. This kind of water cannot, of course, be employed for most culinary and household purposes, as washing, since it invariably decomposes the soap, the lime of the gypsum contained in the liquid yielding an insoluble compound with the margaric and oleic acids present in the soap. If the water, however, owes its hard-

ness to the presence of carbonate of lime held in solution by free carbonic acid, and thus in other language constituting a soluble bicarbonate of the alkaline earth, then the defect in question is easily remedied by boiling the liquid prior to using it. In this case the free gaseous acid is expelled, and the carbonate of lime thus becoming insoluble, precipitates to the bottom of the vessel, and may be re-moved.

Spring water, nevertheless, contains other ingredients besides those just mentioned, which will be alluded to in their place.

When the water in its passage through the soil and the strata below it, becomes charged with saline and other substances, such as the carbonates, muriates, and sulphates of the alkalies and alkaline earths, oxide of iron, free carbonic acid, sulphuretted hydrogen, azote, and carburetted hydrogen, it is then denominated a mineral spring, and is of course unfit for all domestic purposes. Springs recognizable by each of these three characters (hard, soft, and mineral), are abundantly met with in this parish, and will not require to be further described.

The first, or hard water, as one might expect, and as has been shown, derives its hardness from the presence of carbonate or sulphate of lime. Some springs are particularly hard, and such contain a considerable quantity of the salts alluded to. Besides these, they hold in solution some of the muriates, as those of soda and lime, and a small proportion of iron. Their temperature is about 49° of Fahrenheit throughout the year. They are often deep, the spring in this case being discovered at about 20 yards from the surface. Of course this does not always hold good, for there are many where the waters rise above the ground, and are seldom if ever dry, not even during the longest droughts of summer. The sp. gr. of the hard water rarely exceeds 1·012003. By precipitating the lime with carbonate of soda or potash, it is converted into soft water, and when required for chemical purposes it must be distilled. It is, however, not so generally used either in the arts or manufactures as soft spring or river water, and the reason assigned is its hardness, for it is certainly more abundant than the former.

The soft springs are both superficial and deep. They are very numerous, and of course filter through the more quartzy and granitic strata, and more sandy soil, where little or no lime, either as a sulphate or a carbonate, is met with. These, when superficial, are occasionally dry, or nearly so, during the summer months, whilst the deep wells are in the same condition in this point of view as the hard ones. In both cases, the deep water is obtained by sinking or boring. The soft springs vary a good deal as to softness, particularly those which come near the surface, and several instances have of late years occurred where repairs of many such wells have increased the hardness of the water. This fact may be explained either by imagining that the course of the spring has been somewhat changed, so as to bring its water in contact with minerals which impart the property of hardness, or by the supposition that springs of hard water have been turned into the same channel with the soft. Both cases I know to have happened in this parish, and nothing perhaps will appear easier, when we take into consideration how near, in some places, these different springs are to each other. Thus, one side of a street may yield nothing but hard water, while the other furnishes soft spring alone, or both. The same may be asserted of the two extremities of a village or hamlet, and is repeatedly witnessed in this parish. The temperature ranges between 47° and 52° of Fahrenheit, the heat of those wells being lowest whose waters are never dry. The same spring does not however alter much in this respect by changes in the weather, but preserves a nearly similar degree of heat throughout the year. This, nevertheless, happens only when its origin is in the bowels of the earth. There are divers superficial wells with which I am acquainted, and which are remarkable for their soft character, the temperature of which seldom reaches higher than 46° of Fahrenheit, however hot the summer, nor does it sink lower during the severest winters, thus indicating that the source of the spring is in that stratum, whose temperature is uninfluenced by the warmth of the sun. These springs contain certain proportions of the salts of soda and potash, as the carbonates and muriates, together with a trifling quantity of iron, and the sp. gr. is rather greater than usually happens in other instances, being about 1·02314.—The water itself is of the best kind. There is not the slightest brackishness in its taste, a circumstance probably explicable by the absence of peat bogs, and other places where vegetable decomposition is going forwards. This statement is correct as regards most of the springs in this district, whether hard or soft, and should there be any exceptions, they are found in the vicinity of the Moorlands, where the water contracts a slightly disagreeable flavour in consequence of springing from, or flowing amidst the turf and peat, so very thick in these wild regions. It is probably because of the goodness of the water, that the woollen, worsted, and cotton manufacturers thrive so well, their numerous departments, especially dyeing, having been long pursued with unparalleled success. Some of the superficial springs let fall an ochreous deposit, owing to the prevalence of iron-stone and iron pyrites derived from the coal strata, certain portions of the metal being first taken up as a sulphate or carbonate, both of which afterwards become converted into the peroxide by the action of the atmosphere.

Moreover, the pyritic beds connected with the several copperas manufactures, may and do give a tinge to particular waters. Again, in some localities, the soil itself contains so much peroxide of iron as to impart a considerable quantity of ochre to all the springs and streams adjacent, the contents of which are then vulgarly termed "cankered."—The wells of most note, are St. Helen's Holywell, in Stainland,—the Wood and South End wells, at Elland,—Outram's well, in Greatland,—the Broth-dean Spa, in Rishworth, and other wells in Ovenden. In all of these the water is abundant. It is clear as crystal, and sufficiently impregnated with carbonic acid to render it exceedingly palatable. The wells are for the most part very antiquated, particularly the one in Stainland, their first formation being long prior to the existence of any individual of my acquaintance.

The mineral springs are not so numerous, and are of a sulphureous, chalybeate, and carbonated kind. Amongst the first, may be reckoned the Cragg, in Erringden, and the Spa-well at Elland; amongst the second, the Swift Cross Spa, in Soyland, and the Horley-Green Spa, near Halifax; and amongst the last, the Petrifying Well, near Shelf.

The waters of the Cragg, owe their qualities to the presence of sulphuretted hydrogen in combination with soda. Besides these, they are not perfectly free from some of the muriates, as those of soda, lime, and magnesia. Oxide of iron is also discoverable in small quantity, and I believe the presence of the three gases, viz. azote, carbonic acid, and carburetted hydrogen, has been satisfactorily proved. All these ingredients are detected only in minute portions, and as such the Cragg is more an object of attention to the curious chemist and geologist, than to the physician. It is rarely employed save to make tea, and the fact of its holding in solution free soda, and the several salts just mentioned, renders it well qualified for this purpose, the former extracting more of the coloring and active principle. In no respect, however, is it considered equal to the Spa-well, at Elland. This is of moderate value as a sulphureous water. From a set of experiments which I have recently instituted upon it, it would seem, like the Spa just mentioned, to owe its properties to the presence of hydro-sulphuric acid in combination with sodium. All the other saline contents of the waters of the Cragg, are present here, but in greater abundance, and hence the spring is calculated to be more beneficial in certain cutaneous diseases, &c. Formerly, however, it was much stronger, and evidently held in solution a larger share of sulphuret of sodium, &c. Recent improvements have, nevertheless, either in some measure changed the course of the spring, or have brought about an admixture of its own with the waters from adjoining springs. It may be intimated here, that most, if not all, the mineral waters in this parish contain a more minute supply of saline compounds than they did originally, an assertion in accordance with similar observations made in other places, where mineral waters abound, as at Cheltenham, Scarborough, &c.

These sulphureous waters would seem to flow principally from the coal strata, and as such, the source of their sulphuretted hydrogen, &c., must be sought for in some decomposition in progress amongst the vegetable and mineral matters composing this formation. Doubtless, the iron pyrites, assisted by heat, pressure, and time, will exert so powerful an action upon the surrounding layers, &c., as to occasion the development not only of the hydro-sulphuric acid, but also of one or two other gases, which may be present. I have occasionally employed this water in various cutaneous affections, &c., during my practice in Elland, and with very evident success. Its temperature is about 49·5° of Fahrenheit. Like that from the Cragg, it is exceedingly useful for making tea.

The chalybeate springs, are the Swift-Cross Spa in the township of Soyland, and the Horley-Green Spa, near Halifax. The former is not in any note. It does, however, contain sulphate of iron, lime, and other saline ingredients, together with carbonic acid, and would unquestionably prove useful if a larger share of attention were devoted to it. Experiments have shown that the water is 18 grs. in a pint lighter than at a neighbouring spring. It is indebted for its contents to the soil and strata through which it filters,—these consisting of clay, shale, coal beds, sandstone, grit, &c. The iron is derived from the iron-stone resting above the coal. Though tolerably powerful as a chalybeate, it occupies a very inferior position to the Horley-Green Spa, which is by far the most important of its kind in this parish. The strata adjoining this spring, are rich in all the principles calculated to invest the water with those qualities, which have so repeatedly drawn the attention of men of science to its merits.

Within the last year or two, a beautiful and excellent little treatise on this spa, has been published by my highly learned and respected friend Dr. Wm. Alexander, physician to the Halifax Infirmary. From this work, in order that the reader may be made intimate with the nature of the water, I shall take the liberty of subjoining the analysis, as furnished by my scientific friend, Mr. West, of the Leeds school of medicine and surgery.

Temperature 48·5° Fahrenheit.

In each imperial gallon.

Carbonic acid gas	5·5	cubic inches.
Nitrogen	7·25	ditto
Total	12·75	ditto

Grs.		In crystals.
40·77	sulphate of iron, dry,	or 74·5
15·26	..... lime, dry,	or 19·3
5·	..... magnesia, dry,	or 10·25
·32	chloride of calcium,	or ·59
·93	silica	
1.22	alumina	
66·5		

From the preceding analysis, which I have reason to consider strictly accurate, no one will be disposed to impugn its character as a chalybeate. In fact, few if any of our celebrated watering places, rendered notorious for their ferruginous springs, can produce a well fit to compete with the one in question, as not merely the analysis itself, but the strong styptic, inky taste, can testify. It ought to be remarked that in this case, the iron is combined with sulphuric acid, thus forming a proto-sulphate, in the amount of which it greatly exceeds the springs of Brighton, Cheltenham, Tunbridge, and Harrogate. The Cheltenham spring yields 0·8 grs. of oxide of iron in a pint of water;—the Tunbridge, 2·22 grs. of oxide of iron, in each gallon;—and the Harrogate, 2·40 grs. of oxide of iron, in a gallon also.

In a treatise on the Horley-Green Spa, published by Dr. Garnett, Professor of Chemistry at the Royal Institution, in 1790, an analysis of this spring is supplied, which is however somewhat different to the one furnished by Mr. West. This difference is readily explained by the well-authenticated fact, that certain changes are effected in all springs in the lapse of time, during which their channels become worn away, and their sources mixed with fluids from other springs, thus not only deducting from the sum-total of saline ingredients in any specified quantity, but as a consequence, detracting from its general and therapeutic virtues. The medical properties of this water will be readily understood by referring to the analysis. Here it is seen that the sulphate of iron abounds in the largest quantity, and evidently will, in conjunction with other ingredients, constitute a most admirable chalybeate in all those diseases where such remedies are required. When existing in this state, it is well known that iron is infinitely more valuable as a therapeutic agent, than when found as a carbonate, and hence the superiority of the Brighton and other sulphated chalybeates over the carbonated ones. The origin of the different compounds in the Horley-Green Spa, are perfectly explicable on studying the geological relations of the neighbourhood. Here we have pyrites, calcareous marl, and mill-stone grit, which minerals yield, in one way or another, most of the substances alluded to in the analysis. The nitrogen is most likely abstracted from the atmosphere present in the water. The carbonic acid gas may be evolved during the action of sulphuric acid on the calcareous marl. The sulphuric acid is unquestionably formed by the agency of iron pyrites, water, and air, which, so soon as it is developed, unites itself to the iron, lime, and magnesia comprising the marl, thus giving rise to the sulphates of iron, lime, and magnesia. The muriates, as those of soda, &c., abound so plentifully in primitive rocks, and elsewhere, as to leave little doubt that the chloride of calcium, mentioned in the analysis, originates in some composition of the muriate of soda. The silica is obtained from the mill-stone grit, and the alumina from the clay. We need not be surprised at the abundance of sulphate of iron, when we take into consideration the amount of iron-stone prevalent in the parish.

In former articles, I have stated that scarcely a spring or stream exists in the neighbourhood, where more or less of this important material is not apparent, and in the Horley-Green spa, we find it in the largest proportion. As such, the ochreous deposits of many of the waters meandering through the parish, especially those which arise from the coal fields, are fully explained. This circumstance has given rise to the appellation of "Red Beck" to one of the tributaries of the Calder, mentioned in the earlier part of this paper, and to some other rivulets both in the vicinity of the spa, and elsewhere.

Before leaving the subject of the Horley-Green spa, I may just observe that it was considered by Dr. Garnett, as the strongest chalybeate known. Add to this, such are the encomiums passed upon, and such the virtues attributed to it, by my friend Dr. Wm. Alexander, who has had great experience in mineral waters, that I think it merits the best attention from those whose ailments are likely to be benefited by solutions of iron. It is situated in a most delightful part of the country, being surrounded on all hands with that sort of scenery which would afford enjoyment and relaxation to the mind, and which would keep the attention from brooding over the maladies with which the sufferer was afflicted.

I must now offer a few brief remarks on the carbonated waters of this parish, of which we have only a single instance in the petrifying well, at Shelf. Here, in consequence of the lime stone in the different strata, and the excess of carbonic acid evolved by various chemical actions going forwards in the bowels of the earth, as that of sulphuric acid upon carbonate of lime, we have a bi-carbonate of lime generated, wholly soluble in the waters of the spring. Or again, the carbonate of lime may be dissolved by an excess of carbonic acid in the fluid, thus producing the same effects as in the first instance. The water, while running along its channel, or trickling from the sides of the well, becomes, in the course of its exposure to the atmosphere, deprived of its su

perabundance of carbonic acid, and as a consequence a large portion of the carbonate of lime previously dissolved, precipitates to the bottom, or upon any substance which may be in its way, thus forming those various petrifactions, so much admired by the curious. The waters at Shelf are nevertheless a considerable period in effecting any change of this kind, in consequence of the small proportion of carbonate of lime with which they are impregnated. As such, they are infinitely inferior to the dropping-well at Knaresborough.

The phenomenon in both is explicable by a similar course of reasoning. At Knaresborough, the spring issues from a lime-stone rock in the steep declivity of a hill, which occupies the south-western bank of the river Nid. After running about twenty yards towards the river, it spreads itself over the top of another rock, from whence it trickles down in about thirty places, and is accompanied with a musical or tinkling sound in its descent from one ledge to another, and from thence into the waters below. The front of this during the last summer was hung over with plants, flowers, shrubs, birds, and other articles, for the purpose of becoming enveloped in calcareous matter. The water, as it slowly trickles over them, or is evaporated, leaves behind more or less of the carbonate of lime, which it holds in solution, and thus are formed the various incrustations in which visitors take so much interest. The space required for effecting a perfect incrustation upon any article, depends somewhat on its size, but I learned on the spot, that in no period under twelve months could it be fully accomplished. The stalactites deposited here are both numerous and beautiful. When smoothly cut through, in consequence of the iron which they contain imparting to them a brownish color, they admit of most splendid polish, and thus many elegant ornaments, are cut out of them for sale. The water also is charged with magnesia, which doubtless has its share in forming the petrifactions. Petrifying wells are by no means rare. In the joinings of arches thrown up in the construction of railways, stalactites are repeatedly deposited, which hang from the top not unlike icicles. The lime in the soil above, and of the mortar contained in the masonry, is apparently dissolved by the carbonated water which trickles through, whilst the latter, in consequence of its sluggish motion, is evaporated, leaving a stalactite of variable and constantly increasing length. Before concluding, I may just observe, that I have occasionally detected small proportions of free sulphuric acid in the running streams hereabouts, the origin of which was sufficiently explained, whilst discussing the nature of the Horley-Green Spa.

After thus briefly treating of the springs and streams of the parish of Halifax, I feel persuaded that the facts here adduced and established, cannot but draw the attention of every reader to this conclusion, viz., that few other localities in Great Britain, can boast of equal advantages in their supplies of this necessary beverage, whether as a therapeutic or domestic agent. Add to this, its various applications in the arts and manufactures which are here carried on, and the value which is attached to it by those who have occasion to employ it in the processes of dyeing, washing, &c.—all bear ample testimony to this truth, that if abundance of water is required, remarkable for purity or any other property, whether medical or otherwise, it will, with few exceptions be found by the speculator, in the parish of Halifax.

JOHM S. HILEY, M. B.

Elland, near Halifax,
Oct. 7, 1841.

LIMITS OF THE SENSIBILITY OF CERTAIN REAGENTS.*

BY DR. HARTING.

I. SENSIBILITY OF STARCH AS A TEST FOR IODINE.

By preparing a series of solutions, more or less diluted, containing iodide of potassium, slightly acidulated, I obtained the following results, after adding a weak solution of starch :—

No.	Prop. of iodine.	Color of the precipitated Starch.
1.	$\frac{1}{500}$	Black; supernatant liquor, yellow and brown.
2.	$\frac{1}{1000}$	Nearly the same color.
3.	$\frac{1}{2000}$	Same colored precipitate; liquor very slightly colored.
4.	$\frac{1}{3000}$	Blueish black; liquor almost clear.
5—6.	$\frac{1}{5000}$	Blueish black; liquor quite clear.
7—11.	$\frac{1}{10000}$	Very deep blue.
12—15.	$\frac{1}{30000}$ — $\frac{1}{60000}$	Blue, with a violet tint.
16.	$\frac{1}{120000}$	Upper layer, violet; lower layer, rose-colored.
17.	$\frac{1}{150000}$	All the precipitate rose-colored, with a violet tint.
18—19.	$\frac{1}{200000}$	Rose colored, but only the upper part.
20—22.	$\frac{1}{300000}$ — $\frac{1}{400000}$	The whole of the precipitate had a slight rose-color.
23—25.	$\frac{1}{450000}$ — $\frac{1}{550000}$	Upper layer of the precipitate, light rose-color; the lower one, white.

Up to No. 19, the re-action took place immediately after the addition of the starch; the

* *Bulletin des Sciences physiq. et natur. en Neërlande.*

subsequent Nos. required some time; the two last, containing $\frac{1}{300000}$ and $\frac{1}{350000}$ of iodine, presented no change of color for some hours.

II. TESTS FOR ACIDS.

1. *For sulphuric acid:*—

Syrup of violets does not detect beyond $\frac{1}{250}$ of sulphuric acid of sp. gr. 1·829:

Subcarbonate of soda, gives a slight effervescence with $\frac{1}{250}$:

Paper stained with an aqueous solution of Fernambouc, does not act beyond $\frac{1}{10000}$;—that dyed with tincture of red cabbage, is slightly reddened by $\frac{1}{150000}$:

Hœmatosine (Campeachy wood) immediately takes a yellow color with $\frac{1}{50000}$:

Paper dyed with the aqueous tincture of turnsole, is immediately colored by $\frac{1}{2000}$; and, after an hour, very slightly by $\frac{1}{50000}$:

Sulphuric acid of the above sp. gr. contains, according to Dr. Ure, 75·83 per cent of anhydrous acid.

2. *For phosphoric acid:*—

Paper stained with the aqueous tincture of Fernambouc, or with red cabbage, will detect $\frac{1}{10000}$ of anhydrous phosphoric acid:

Turnsole paper reddens immediately with $\frac{1}{10000}$, and after an hour with $\frac{1}{30000}$.

III. REAGENTS FOR VARIOUS ACIDS.

1. *For sulphuric acid.*

a. For free sulphuric acid:—

A concentrated solution of chloride of calcium precipitates, at the end of a few hours, with $\frac{1}{250}$ of sulphuric acid of sp. gr. 1·829:

A solution of acetate of lead gives a precipitate with $\frac{1}{40000}$:

Chloride of borium detects $\frac{1}{60000}$:

b. For sulphuric acid combined with a base:—

Acetate of lead renders turbid a solution of sulphate of soda containing anhydrous sulphuric acid in the proportion of $\frac{1}{36000}$:

The solution of chloride of barium precipitates $\frac{1}{45000}$ of this acid contained in the solution of the same salt.

2. *For nitric acid:*—

By means of hydro-chloric acid and a small piece of gold leaf, I have been able to detect $\frac{1}{240}$ of nitric acid of sp. gr. 1·32. The gold leaf was not dissolved for four hours.

3. *For phosphoric acid:*—

The acetate of lead immediately precipitates the liquid containing $\frac{1}{10000}$ of anhydrous phosphoric acid, and after half an hour, that containing $\frac{1}{20000}$:

Lime water renders turbid the solution of $\frac{1}{10000}$ of this acid, and after an hour that of $\frac{1}{20000}$ also presents a slight precipitate:

The solution of the chloride of barium does not precipitate more than $\frac{1}{10000}$ of phosphoric acid.

4. *For arsenious acid:*—

Lime water added in excess, detects $\frac{1}{4000}$ of this acid dissolved in water:

The ammoniacal solution of copper shows the presence of $\frac{1}{8000}$:

Hydrosulphuric acid, dissolved in water, produces a precipitate with $\frac{1}{36000}$ of arsenious acid:

The ammoniacal nitrate of silver gives a lemon yellow precipitate with $\frac{1}{36000}$ of this acid: this color is not distinct in more dilute solutions.

IV. TESTS FOR METALS AND THEIR OXIDES.

1. *For free alkalis in general:*—

Paper colored with the aqueous tincture of curcuma denotes the presence of $\frac{1}{3000}$ of caustic potassa:

That of red cabbage detects $\frac{1}{7500}$ of the same alkali:

That of Fernambouc is colored of a light violet with $\frac{1}{20000}$:

The blue color of turnsole paper, reddened by acetic acid, is returned by $\frac{1}{80000}$ of potassa.

2. *For potassa:*—

The alcoholic solution of chloride of platinum precipitates a solution of nitrate of potassa, containing $\frac{1}{205}$ of that base, but has no effect on that which contains only $\frac{1}{230}$:

A very concentrated solution of tartaric acid detects $\frac{1}{220}$ of potassa, but does not act on $\frac{1}{230}$:

The sensibility of these reagents was examined at a temperature of 12° C.

3. *For lime:*—

Oxalate of ammonia renders turbid, after a few moments, in a very perceptible manner, a solution of chloride of calcium which contains $\frac{1}{400000}$ of lime.

4. *For baryta:*—

Fluo-silicic acid slightly precipitates a solution of barium, which contains $\frac{1}{3800}$ of that base:

A solution of sulphate of soda, after half an hour, detects $\frac{1}{71000}$:

Fluo-silicic acid is a very certain test for distinguishing soda from potassa by aid of the microscope. The precipitate obtained in solutions of potassa, free or combined, is presented to the microscope under the form of gelatinous masses without any crystalline texture, while the precipitate with soda or its salts is always in beautiful hexagonal crystals.

5. *For magnesia:*—

The solution of subphosphate of ammonia detects in a solution of sulphate of magnesia, after 24 hours, $\frac{1}{200000}$ of magnesia, provided that the test be very concentrated and added in quantity equal to the liquid under examination:

Liquid ammonia gives rise, after a few minutes, to a slight precipitate in a solution of the same salt, containing $\frac{1}{6000}$ of magnesia.

6. *For iron.*

a. For the protoxide:—

The tincture of galls and the solution of deuto-cyanuret of potassium and iron, acidulated by a few drops of hydrochloric acid demonstrate, after a few minutes, in a solution

of crystallised protosulphate of iron, the presence of $\frac{1}{440000}$ of protoxide.

b. For the deutoxide:—

The tincture of galls imparts a slight violet tint to a solution of deuto-sulphate of iron containing $\frac{1}{300000}$ of deutoxide:

The proto-cyanuret of potassium and iron detects $\frac{1}{120000}$ in a solution of the same salt.

7. *For copper:*—

Liquid ammonia imparts, after some hours, a slight blue tint to a solution of deuto-sulphate of copper containing $\frac{1}{9400}$ of deutoxide of that metal:

Proto-cyanuret of potassium and iron shows $\frac{1}{78000}$ of that oxide in a solution of the same salt:

Well-polished iron demonstrates $\frac{1}{125000}$ of deutoxide, or $\frac{1}{156000}$ of metallic copper in a similar solution acidulated by one drop of nitric acid.

8. *For lead:*—

A plate of zinc precipitates the lead contained in a solution of nitrate of lead in which there is $\frac{1}{3000}$ of the protoxide.

9. *For silver:*—

Chromate of potassa produces a red precipitate in a solution of nitrate of silver containing $\frac{1}{1000}$ of oxide: there is no reaction beyond $\frac{1}{20000}$:

Arseniate of potassa gives a very distinct yellow precipitate with $\frac{1}{6000}$, but does not act beyond $\frac{1}{20000}$:

Iodide of potassium produces a yellow precipitate with $\frac{1}{4000}$, and nothing beyond $\frac{1}{30000}$ of oxide:

Hydro-sulphuric acid, dissolved in water, precipitates $\frac{1}{35000}$:

Chloride of sodium immediately renders turbid a solution containing only $\frac{1}{24000}$ of oxide.

ON THE MANNER IN WHICH ALLOXAN ACTS WHEN BOILED WITH WATER.*

BY MM. WOHLER AND LIEBIG.

If a concentrated solution of pure alloxan be submitted to ebullition, it immediately disengages carbonic acid gas: this disengagement lasts for a long time. It then gives with baryta a deep blue precipitate, and with carbonate of ammonia an abundant crystallisation of murexide. It deposits while cooling, and even during ebullition, a great quantity of alloxantine, of which it previously presented not a trace, which explains the production of the murexide. If the supernatant liquors be saturated by ammonia, oxalurate of ammonia is obtained.

Three atoms of alloxan give:—

2 at. alloxantine	=	$C^{16} H^{20} N^8 O^{20}$
1 at. parabanic acid	=	$C^6 H^4 N^4 O^6$
2 at. carbonic acid	=	$C^2 \quad\quad O^4$
		$C^{24} H^{24} N^{12} O^{30}$

ON THE SALTS OF PROTOXIDE OF MERCURY.†

BY H. ROSE.

The fixed alkalis have rightly been considered the most energetic of all bases. Besides this basic energy, they present other properties which are unconnected with it; but it has long been thought that they must necessarily belong to all energetic bases, and the only reason for this opinion is, that they had been observed in the alkalis.

The oxygen in the alkalis is intimately connected with the metal: the difficulty of reducing the metal was long considered an essential property of an energetic base. It is only lately, and after much prejudice, that chemists have decided on admitting oxide of silver as an energetic base; the weak union of silver and oxygen in the oxide being the only reason. But the properties of oxides of forming weak or energetic bases, and of more or less powerfully retaining oxygen seem to be independent. In a great number of oxides, as in many earths, the oxygen can be separated from the metal only with the greatest difficulty, and sometimes even incompletely, and still these oxides often belong to the weakest of all bases.

The property of oxides of forming energetic or weak bases most frequently depends on the number of atoms of oxygen with which one atom of the metal combines. The basic properties of an oxide are so much the more energetic as the number of atoms of oxygen is less comparatively with those of the metal with which it is combined. The protoxides of copper and mercury, which seem generally to be ranked among weak bases, would appear to make the only exceptions to this rule: but these exceptions are only apparent; for these two oxides possess peculiar properties, which have no connection with their basic property, but which cause them to be considered weaker bases than they really are.

A long time ago, I endeavoured to show that oxide of silver should be regarded as a combination of one atom of oxygen and two of metal. More recently, M. Regnault, in his investigations concerning the specific heat of simple and compound bodies, confirmed this opinion, and found at the same time that the fixed alkalis ought, for the same reasons, to be composed, like oxide of silver, of two atoms of metal and one atom of oxygen; and the fact discovered by M. Mitscherlich, that

* *Annalen der Chemie und Pharmacie*, Vol. xxxviii. page 357.

† *Journal de Pharmacie, Sept.* 1841.

several salts of silver are isomorphous with the corresponding salts of soda, leads to the same conclusion.

We must therefore admit in the alkalis and oxide of silver the same composition as in the protoxides of mercury and copper, and the latter should consequently belong to the more energetic, although they have hitherto been regarded as weak ones.

It is generally stated in chemical works, that the protonitrate of mercury is decomposed by water into a basic salt. If this were true, we should not hesitate to class protoxide of mercury among the weak bases, for water can separate none but weak bases from salts, since in this case it fulfils the part of a base, and precipitates, in the state of an oxide or of a bibasic salt, those bases which are weaker than itself.

There are particularly only bases formed of a double atom of metal and three atoms of oxygen, which water separates from their salts, and, of the great series of oxides formed of one atom of metal and one atom of oxygen, the deutoxide of mercury which is evidently the weakest base of all, is the only one decomposable by water; as for the protoxide of mercury, this property belongs to it only in appearance.

It has long been known that the protoxides of copper and mercury possess the property of being decomposed, under the influence of several reagents, into metal and an oxide containing more oxygen. It is this property, and that of acquiring more oxygen from the air (properties which are independent of their basic functions), which have caused it to be erroneously supposed that the salts of protoxide of mercury are decomposed by water like salts of weak base; indeed, these protoxides retain the same properties in their salts, and hence the production of deceiving phenomena.

It is a very old observation, that in the preparation of sulphate of copper by the calcination of copper with sulphur and the lixiviation of the calcined mass by water, there is dissolved with the sulphate of deutoxide of copper, some sulphate of protoxide; the latter is slowly decomposed in the solution into sulphate of deutoxide and metallic copper, which may furnish very considerable masses in the manufacture of sulphate of copper.

All the salts of protoxide of mercury present a decomposition similar to that of sulphate of protoxide of copper, but in a different degree. We obtain, when they are heated by water, metallic mercury mixed with undecomposed salt (which is, in most cases, very little or not at all soluble), and a salt of deutoxide. But the latter is in its turn decomposed by water, and often produces a basic salt. If nitrate of protoxide of mercury be boiled with a large quantity of warm water, there separates, besides metallic mercury, a crystalline salt, not very soluble, and of a lemon color, which is again decomposed by boiling with a greater quantity of water, and which has been regarded as formed partly of nitrate and partly of basic nitrate of protoxide of mercury; it is, however, a double salt of nitrates of deutoxide and protoxide of mercury. One proof that the protoxide of mercury is an energetic base is, that it forms with carbonic acid an anhydrous neutral salt (very easily decomposed, it is true)—a property which belongs only to very energetic bases; in general, it forms with even very weak acids better defined combinations than some which are ranked among energetic bases.

The combinations of protoxide of mercury, with most of the organic acids, very much resemble those formed by oxide of silver with the same acids: these salts are among the least soluble: however, those of protoxide of mercury are less so than those of oxide of silver.

ON THE OXYDATION OF ALCOHOL BY CHROMIC ACID.*

BY DR. RUDOLPH BÖTTGER.

It is a well-known fact, that spongy platinum, peroxide of manganese, and other spongy bodies, according to Döbereiner's experiments, have in certain conditions, the power, by developing the oxygen of the air, of oxydizing alcohol, and converting it into a peculiar fluid containing aldehyde, which has received the name of lampic acid. The other conceived that a similar oxydation of alcohol might be affected by means of chromic acid, which, it is well known, readily yields to many substances a portion of its oxygen. It has hitherto been supposed, that chromic acid is soluble in alcohol, and that the solution is decomposed by light and heat. According to Dr. Böttger's experiments, alcohol is immediately decomposed by dry chromic acid, and as will appear from the sequel, not unfrequently with powerful development of light and heat. If dry chromic acid is thrown into absolute alcohol, it is immediately deoxydated with the evolution of powerful heat (*unter heftigerm glühen*), whilst the developed oxygen, at the moment of its separation, combines with the alcohol, and converts it immediately into the aldehydic fluid, which is at once recognized by its highly penetrating odour. If about a teaspoonful of dry chromic acid is placed in a porcelain capsule, and moistened with a few drops of absolute alcohol, the latter is immediately inflamed, whilst the reduced portion of the chromic acid becomes red hot for a considerable time. If the absolute alcohol is mixed with a little sulphuret of carbon, a fluid is formed which catches fire on the

* *Annalen der Chemie und Pharmacie*, January, 1841.

contact of the smallest portion of chromic acid, whilst sulphuret of carbon alone, is not in the least affected by chromic acid.

If a clean glass vessel, capable of containing a pound of water, is filled with a mixture of atmospheric air and vapour of alcohol, and a few grains of dry chromic acid are thrown into it, immediately an explosion occurs, which, however, is quite free from danger if the mouth of the vessel be left open. If, after the explosion has occurred, we introduce as quickly as possible, a few drops more absolute alcohol, with as much chromic acid as will lie on the point of a knife, and shut the vessel, if the atmospheric air has all been expelled by the explosion, the decomposition of the chromic acid and alcohol, goes on in a quiet but very interesting manner. If the experiment be conducted in a somewhat darkened room, we observe the developed oxyde of chromium, in a fine state of division, and incomplete incandescence moving about in the glass. The most common appearance is that each particle of oxide like a glowing meteor, curls round on its axis with inconceivable velocity, and continues in this state of motion and incandescence in the newly formed aldehydic atmosphere, so long as the least particle of undecomposed alcohol remains in the vessel. The author has frequently observed, even in day-light, this remarkable appearance last from eight to ten minutes.

LONDON ELECTRICAL SOCIETY.—OBSERVATIONS ON THE ELECTRICAL EFFECTS OF THE GYMNOTUS.

At the Meeting, on Tuesday the 19th ult., the Secretary read before the Society a Translation of a paper on this interesting subject by Prof. Schönbein. The object of the writer was to trace the extent of our acquaintance with the causes which operate in producing the peculiar powers possessed by this fish. He shewed that neither the physical nor the mechanical structure of the electric organ can account for this; and that, though this organ is in some degree analogous to Volta's pile, yet by its very nature it falls immeasurably below that formidable arrangement. That no artificial combination of such substances, as form the organ, will produce effects worthy of comparison with the feeblest results of metallic arrangements; that even if the action were traced to something similar to Volta's pile, yet the analogy could not hold good, seeing that the said organ is always immersed in a solution, which forms a medium of connection between the two poles, and yet, contrary to all known laws, no discharge takes place. The author then dwells at great length upon the intimate connection between this power and vital action; and clearly illustrates by fact and analogy every position he assumes. The paper extends to some length; but no paragraph could be omitted without disjointing the well devised adjustment of the whole. The modesty with which the Professor confesses how little we really know of this abstruse subject, affords an admirable lesson to those would-be philosophers who fancy that by a mere superficial glance, or by an inspection of but one feature of a subject, they have obtained a knowledge of the whole.

Then was read "An Account of Experiments with a Water Battery." By H. M. Noad, Esq., Mem. Elec. Soc. Mr. Noad prepared a series of 500, contained in green glass tumblers, insulated on strips of walnut-tree wood, supported by glass legs. These are a portion of 2000, which he intends arranging. The insulation was not perfect, even with these precautions; indeed, when so great a degree of tension is obtained—a tension closely allied to that of common electricity—it is next to impossible to obtain perfect insulation. The only feasible plan of effecting this is, in the author's opinion, to mount *each pair* on a varnished glass pillar—a plan, as he remarks, involving an expense not altogether acceptable to a private individual. We must refer to the Proceedings of the Society for an account of the effects of this arrangement.

The Secretary then laid before the Society Mr. Weekes's Register, for the month of September.

REVIEWS:—

THE OILY ACIDS; *Forming the first Supplement to the seventh edition of Dr. Turner's Chemistry.* By Justus Liebig, M.D. Professor of Chemistry in the University of Giessen, and William Gregory, M.D., Professor of Chemistry, King's College, Aberdeen.

We congratulate our readers and all interested in the science of chemistry, especially that part of it which relates to organic matter, on the appearance of the first supplement to the late Dr. Turner's Elements, edited by Professor Liebig, of Giessen. To those who may have been of sufficiently long standing to be acquainted with the state of organic chemistry, forty years ago, a work such as that now before us must prove a most gratifying bequest. It may with truth be said that this once abstruse and hopeless subject is now established on as firm a basis, and its laws traced with as much certainty and accuracy as those which cause and regulate the actions and changes of inorganic matter. For most of those invaluable discoveries which are the subjects of this volume, we are in a great measure indebted to our Continental brethren. The names of Chevreul, Gay Lussac, Bra-

connot, Boudet Poutel Laurent, Frémy, and particularly of Liebig, must ever be distinguished in this branch of chemical science.

This supplement is not more conspicuous for the excellent arrangement of its subjects and the accuracy of its deductions, than for the clearness of its language and neatness of its style.

In the section "on the action of nitrous acid on oils," some very important results are detailed, which we are enabled fully to confirm from those obtained by ourselves several years ago, during some very extensive experiments made with nitrous acid, both alone and in combination with other agents, particularly such as readily yield oxygen.

Many very valuable facts are developed in the chapter on the action of metallic oxides on fixed oils and fats. By the combination of these bodies with oils, two kiuds of compounds are formed, soaps and plasters. Until the time of Chevreul, the process of soap-making was entirely empyrical, and the maker completed his operation through skill acquired by practice, and not by any certain guide or rule. We agree with Professor Liebig, in the observation that "soap-making may now be considered as one of the arts most thoroughly understood." The cause of the great advancement in the knowledge of this art, is the discovery by Chevreul of the changes, or rather, developments, which take place during the process.

"Chevreul showed that the different kinds of fixed oils and fats contained three distinct compounds, united in the most various proportions: one, liquid at ordinary temperatures, which he called oleine; and two solid, but differing in fusibility, stearine, and margarine.

"He also showed that three of these contained oxide of glycerule, (glycerine,) in combination witb an oily acid; and that when the oil or fat was acted on by the alkalies, or by oxide of lead or zinc, these bases united with the oily acids,—forming in the first case, soluble soaps; in the other, insoluble plasters. The oxide of glycerule in the moment of separation united with water, forming hydrated oxide of glycerule, (glycerine, or sugar of oils.) When the weight of the glycerine was added to that of the oily acid, after the latter was separated from the bases, their united weights exceeded somewhat that of the original oil; which he showed to arise from the fact, that both the oily acids and the glycerine, when separated from other substances, combine with water. With ordinary oils and fats no other products are formed; but when the oil or fat contains any of tbe volatile oily acids, such as butyric or phocenic acids, the soap contains a salt of the volatile acid, and acquires its smell.

"Soaps are divided into *hard* and *soft soaps*. The former are obtained from fats or oils; the latter from drying oils. Of the hard soaps, those containing soda are firmer than the soaps of potash. Of the hard soaps of commerce, those made with vegetable oils are mixtures of oleate and margarate of potash or soda; those made with animal fats are mixtures of stearate, margarate, and oleate of potash or soda.

"In order to form soap, the oil or fat is boiled with a solution of caustic potash or soda, till the whole forms a thick viscid emulsion, which can be drawn out into long clear threads. If not clear, either water or alkali must be added, according as the turbidity depends on undecomposed oil, or on a deficiency of water. Wheu the saponification is complete, the next step is to separate the soap from the excess of alkali, the glycerine, and the superfluous water. This may be effected by boiling down till the alkaline ley becomes very concentrated, when the soap becomes insoluble, and rises to the surface. The same end is attained by adding very strong ley, or common salt, both of which render the soap insoluble in alkaline ley of a certain strength, as well as in a solution of common salt. The separation is known to be complete when the liquid ceases to froth when boiling; and the soap is ladled off into moulds, where it is well stirred to favour the separation of the liquid, wbich should run off from its surface like water from fat. The soap brought to tbis state in the first operation is called *grain soap*, from its separating in grainy particles at first. It may be further purified by repeating the process of dissolving it in alkaline ley, and separating it by the addition of salt. In this process the impurities subside, and the soap generally takes up more water; so that, although whiter, it is less strong. White soap, for example, commonly contains 45 to 60 per cent. of water, while grain soap only contains 25 to 30 per cent. No doubt it might be again procured with as little water as at first; but it is the fluidity caused by the additional water that allows the impurities to subside, and the soap to become white. What is called marbled soap is grain soap which has not been subjected to purification; and the grey, blue, and green colors in it arise principally from the presence of insoluble soaps of oxides of iron or of copper.

"It is to be observed, that when common salt is added to the solution of a soap of potash, the latter is converted to soda soap, entirely or partially, according to the quantity of salt, while chloride of potassium is formed. As this latter salt does not cause the soap to separate, like common salt, it is necessary to use twice as much salt to separate the soap when it has been made with potash.* If a

* Our friend Mr. STURTEVANT, of London, has lately taken out patents for making soap without separation of leys, and finds that by

soap of potash be required, it must be separated by caustic potash. In Germany, soda soap is first made with potash, and the potash soap is decomposed by common salt. In England and France, soda soap is made directly with caustic soda.

"The use of salt in this important process depends on the curious fact, that soap, like muscular fibre or animal membrane, cannot be moistened by a saturated solution of salt; that is, cannot deprive it of water. On the other hand, if these substances be moistened with water, or dissolved in it, the addition of dry salt in sufficient quantity will remove the whole of the water.

"Soft soaps are made with drying oils, either alone, or mixed with train or other fat oils. They are insoluble in strong alkaline ley, and are separated from water by the addition of potash or soda. When train oil is added, they have the disagreeable smell of that oil, arising from phocenic acid.

"Such is a very general and brief account of the principles of soap-making, which are few and simple. The great experience of the makers of a substance so long known had taught them empirically how to produce good soap in a great variety of forms; but it is only of late that the rationale of their processes has been understood, and that improvements have been made on scientific principles. Soap-making may now be considered as one of the arts most thoroughly understood.

"It is impossible here to describe the varieties of soap. Of the simple soaps, stearate of soda may be considered the type of hard soaps. It is hardly altered by contact with ten parts of water. Stearate of potash, with ten parts of water, forms a viscid solution. The margarates of soda and potash resemble the stearates. Oleate of soda dissolves in ten parts, oleate of potash in four parts of water. Hence, soaps are harder and less soluble, the more stearate and margarate they contain; and softer and more soluble when oleates predominate.

"As the soaps of lime, baryta, earths, and metallic oxides in general are insoluble, the use of hard water, which contains salts of lime, causes a precipitation of the insoluble soap, which is very prejudicial. This may be corrected by adding to the water as much carbonate of soda or potash as is sufficient to separate all the lime, before the water is used to dissolve soap. It is in this way that soda renders hard water soft, for washing and other purposes.

"The soap used in medicine is a hard soap, made by boiling to dryness in a gentle heat, one part of soda ley, sp. gr. 1·83, and two parts of olive or almond oil. It is a mixture of margarate and oleate of soda, with free soda and glycerine. *Antimoniated soap* is made by dissolving one part of precipitated sulphuret of antimony in caustic potash, mixing the solution with six parts of medicinal soap, and evaporating to dryness."

The preceding is one of the most simple, clear, and intelligible descriptions of the process of soap-making which we recollect ever to have seen, and gives as much practical detail as is required for the complete knowledge of the operation. Our long connection with this branch of practical chemistry, enables us amply to attest its value.

From the following, it will be evident that in the formation of plasters, the same changes take place in the oils as when formed into soaps: as their process is very tedious and unscientific, we advised the decomposition of olive-oil soap by means of one of the salts of lead.*

"PLASTERS.

"There are two kinds of officinal plaster made with lead:—litharge plaster, and white lead plaster; but all the compounds of oxide of lead with the oily acids possess the properties of plaster.

"*Litharge plaster*, or Diachylon plaster, is made by boiling five parts of levigated litharge (protoxide of lead) with nine of olive oil, and some water, till the whole acquires a proper consistence and a greyish white color. At common temperatures it is plastic; when heated it melts. It may also be obtained by adding subacetate of lead to a solution of soap. The plaster thus formed is good at first, but afterwards becomes hard; while that prepared directly from the oil remains plastic, apparently from the presence of undecomposed oil. Litharge plaster consists chiefly of a basic oleate and margarate of lead. It is the basis of almost all medical plasters.

"*White lead* plaster (Emplastrum cerussæ) is made in the same way, using sixteen parts of carbonate of lead to nine of olive oil. It is white, plastic in the heat of the hand, liquid at 212°. It enters into the composition of many plasters used in medicine.

"*Iron plaster* and *Mercurial plaster* are made by adding salts of mercury and iron to a solution of soap. They are insoluble masses, softened by heat, and are not much used."

We conclude our remarks for the present, expressing our firm conviction, that this supplement will prove highly valuable, by inducing attention to this part of chemistry, and that it will be the means of leading to still further

employing alkalis of a given strength, an excellent soap is produced, having, when hot, the appearance of glue: on cooling it becomes a fine hard soap. He also finds that the addition of a large quantity of salt does not produce any separation.—Eds.

* See *The Chemist*, No. XV. page 91. March 1841.

discoveries. It will be read by all lovers of the science as a most valuable portion of an elementary work on chemistry which has no rival at the present day. In our next, we shall notice this work at greater length, and in a more complete manner; want of time and space this month not enabling us to do it the justice which it merits at our hands.

An Easy Introduction to Chemistry. By George Sparkes, late Madras Civil Service. London: Whitaker and Co., Ave Maria Lane.

This work constitutes an addition to the numerous attempts at removing some of the greater difficulties which beset the path of the incipient chemist, and it is by no means the least deserving of them. The instructions which it contains are given in language remarkable for its explicitness and for its freedom from the technicalities which serve so much to confuse the mind of the uninitiated.

The quantity of scientific matter contained in this little work does great credit to the author, who, in sending it forth to the world, has conferred on beginners in chemistry a benefit which, we have no doubt, will be duly appreciated. Such a work was much wanted.

PROCEEDINGS OF THE LONDON ELECTRICAL SOCIETY. — Session, 1841–2. Edited by The Secretary. London: Simpkin, Marshall, and Co., Stationers' Hall Court. Part II.

This part maintains the character which the first part acquired. Among the most important of its contents, we may mention Mr. Pine's second paper on the "Connection between Electricity and Vegetation." Mr. Pollock's second paper on the "Nature of the change of color of bodies by heat, &c.;" "The monthly register of the Electrical, &c., state of the atmosphere, for the months of June, July, and August, 1841," by Mr. W. H. Weekes; "Voltaic process for etching Daguerréotype plates," by Professor Grove. There are also some excellent papers by the secretary, Mr. C. V. Walker. Such of our readers as take pleasure in the study of the delightful science of electricity and its phenomena, will do well to read these "Proceedings."

LECTURES ON CHEMISTRY; *including its applicatians in the Arts.* By Henry M. Noad, Lecturer on Chemistry, Author of Lectures on Electricity, &c. London: R. Hastings, Carey Street; Scott, Webster, and Geary, Charter-House Square. No. IV.

The present number of this excellent work, which fully deserves the high opinion we have expressed concerning it, is devoted to the subject of "Chemical Affinity," and the theory of definite proportions.

Being unable this month to give an extract, which we hope to do another time, we will conclude by repeating our recommendation of it.

ELECTROTYPE MANIPULATION.— Part II.: *containing The Theory and Plain Instructions in the Arts of Electro-Plating, Electra-Gilding, and Electra-Etching, with an account of the several applications of Electrotype in the Arts.* By Charles V. Walker, Hon. Sec. Lond. Elect. Soc. Illustrated by wood-cuts. London: George Knight and Sons, Foster Lane, Cheapside.

This part contains much matter of practical and scientific value, and is a most excellent sequel to Part I. The author gives plain and easy directions for performing the various operations mentioned in the title.

To those who are desirous of obtaining a thorough knowledge of the subjects treated of in this little work, with as little cost as possible, it will be hailed as a boon; its cheapness bringing it within the reach of every class of readers.

Our remarks on Part I. apply with equal, if not greater force to Part II., and we recommend both to the perusal of such of our readers as may be desirous of becoming conversant with the beautiful art of Electrotype, and with the several arts which are intimately connected with it.

We regret that space does not admit of our giving an extract.

II. CHEMICAL MANUFACTURES.

PREPARATION OF A NEW BROWN PIGMENT.

BY T. W. NAYLOR.

In consequence of the high price of good water colors, artists employed in that style of painting have universally acknowledged the introduction of cheap and useful substitutes as a great desideratum. The pigment I am about to describe is intended to be used instead of some of the expensive brown colors, such as *sepia* for instance, which is generally sold in little cakes at 1s. 6d. each.

The new paint is prepared from the wood of the rosewood tree (*aspalathus,?*). The coloring substance is deep brown, not acted upon by water, but readily soluble in pyroxylic spirit, alcohol, and alkaline solutions, which latter are used as the solvents in the present instance.

The mode of procedure is as follows :—

The rosewood, in small pieces, is put into an earthen pan, and a moderately strong solution of either potassa or soda added thereto, when they are boiled together for about ten minutes, at the expiration of which time the greater part of the coloring matter will be extracted ; but, should there still appear a good deal more in the wood, the boiling must be repeated with the addition of a little more of the solution of alkali. The whole must now be poured on the filter, and the clear liquid evaporated to a proper consistence, a portion of gum and isinglass is added, and the color formed into cakes, if thought necessary. Thus prepared, it cannot be used along with either Prussian blue, the lakes, or gamboge, on account of the alkali it contains, which would quickly change the color of those bodies ; indeed, the Prussian blue would be totally destroyed, with the formation of a ferrocyanate of potassa or soda ; nevertheless, no perceptible alteration was observed in the colors of vermillion, cobalt blue, chrome yellow, India red, indigo, yellow ochre, dragon's blood, umber, Venetian red, and terra-sienna.

Thus you may have an excellent brown water color, at the expense of a few halfpence, equal in quality to any of the prepared cakes sold by the colormen. To those individuals whose business is the coloring of prints, maps, &c., I think it must be of great service, both on account of its simple and easy mode of preparation and the cheapness of the materials.

From the circumstance of the resinous coloring matter being soluble in spirits, it may be advantageously used for communicating a deep brown tint to varnishes, &c., for lacquering, japanning, staining wood, and polishing. Its alcoholic solution, mixed with a little gum lac, forms a fine transparent brown varnish, free from any kind of glare or gaudiness, rendering it thereby a most admirable mixture for coloring such musical instruments as the violin, violoncello, &c., giving them, likewise, that appearance of great age at present so much admired ; I have used its solution in carbonate of soda, for the same purpose, with great success, but the application of a coat of strong varnish will be requisite, in order to protect it from the effects of wet or dampness, which would otherwise dissolve the color and spoil the appearance of the instruments.

I am not aware the beforementioned wood has ever been employed in the arts of dyeing and calico-printing, but, from an experiment or two which I made, there is no reason to doubt but it will form a very useful dye for such articles as require brown colors of a great variety of shades ; the alkaline solution may be decomposed by a weak acid, the coloring substance attaching itself to the fabric, which will produce a depth of tint proportionate to the strength of the bath, and the time in which the goods have been immersed.

That variety of the wood ought to be chosen which shows the darkest streaks, for any of the purposes before alluded to ; but the dust from the logs as they are sawed into veneers can be had in abundance, and is, from its fine state of division, perfectly adapted for the extraction of the coloring matter.

MODE OF PREVENTING THE PRINT ON PLATES, BOOKS, &c., FROM TURNING BROWN BY AGE.

BY T. W. NAYLOR.

Every body will have observed the disagreeable brown appearance, resembling a halo, surrounding every line, letter, &c., of old printed works : it arises from the nature of the printing ink, the oleaginous portion of which soon leaves the black matter and is absorbed by the paper, leaving a stain of the above description fixed thereon. Although it is not my intention to say any thing as to the recovery of such books or plates to their original state, yet I think something can be done to preserve new works of value. The method I have adopted is to steep the articles in a strong solution of alum mixed with a little isinglass ; this mixture is intended to fill up the pores of the paper, and thereby take away its absorptive nature. I have prepared some prints in this manner, which do not appear to have changed color in the least, but, what may take place after the lapse of years it is not in my power to say.

To the Editors of The Chemist.

Ryde, Oct. 1, 1841.

Gentlemen :—

I find, on reading my letter which is inserted in No. XXII, of the Chemist, that a mistake has been made in the quantity of one of the ingredients mentioned therein ; I mean the *spermaceti*. Those quantities would make a very different composition and one which would not succeed ; I shall therefore feel obliged by your correcting it in a future number.

I cannot imagine how the error could have occurred, unless it was a mistake of the printer. I am, Gentlemen,

Yours respectfully,

John Horsley.

Mutton Suet ..... 1¾ oz
White or Virgin Wax .. 1¾ oz.
Spermaceti ..... ½ *a pound.*

[The error lies at the door of our esteemed correspondent himself.]

III. PHARMACY, &c.

ON A NEW SYSTEM OF MEDICAL EDUCATION, GOVERNMENT, AND PRACTICE.

BY CHARLES WATT.

Οὕτω γὰρ ἄν μάλιστα καὶ δυνήσομαι εἰπειν, καὶ ὑμεῖς μαθήσεσθε.

ESCHINES.

HAVING in our last number, given ample details of the bad effects resulting to the pupil and to the public, from the present defective and degraded state of scientific education, especially that portion which relates to medical science, we may observe that any attempts at reform in the government, will be utterly useless, unless they he founded on an improved mode of study, and on a more effectual and extended, but less capricious and cruel mode of examination; and therefore in continuation of the subject we now proceed to lay before our readers, a NEW AND IMPROVED METHOD, which must destroy the deference paid to a bad, though established, custom, — which must, at one swoop, remove the numerous and lamentable sources of ignorance and immorality, with which the one now in use abounds,—and establish in its stead, one which places in the hands of the student, the easiest and most certain method of gaining a knowledge of his profession, while it gives to the public perfect protection against the dangers of ignorance and the presumption of pretenders;—a method which, from the necessity of making due and daily progress, it enforces on the pupils, and the evidence it affords of their advancement or of their neglect to the professors, must, at length, prevail, despite of every obstacle that conflicting interest and grasping cupidity can oppose,—one which, by the well-arranged distribution and constant employment of the time of the student, secures him against the allurements of bad company and habits of idleness, enables him to gain his diploma with ease and honor, and finally hands him over to society without disgrace to the one, or peril to the other. Such a plan, we are convinced, will be readily admitted by all who peruse this section of our subject to be a valuable substitute for the buffoonery of lecturing and bully, to justify us in prefixing the above motto from Eschines—"For thus shall I be able to teach and you will learn most effectually."

Sure are we, that there is no one who has passed the ordeal of examination at either Board, viz. Apothecaries' Hall or College of Surgeons, who would not have rejoiced at the opportunity of such a method of study; and no one who is about to do so, who would not hail as a boon, a system of instruction which renders secure his admission without that dread of rejection and consequent disgrace, which, in those who have suffered them, as we have frequently observed, never, in after life, are totally removed, and of which the memory is often revived by rivals who, having the power, are always ready to do the foul work of disparagement to one of their own profession.

In the course of this general view of the new system, it is our wish first to point out the vast contrast between the two methods, that—while none will deny that under the existing one, very limited and deficient knowledge is quite enough to gain a certificate,—under the one which we propose, it is utterly impossible that any deficiency of knowledge should not be made evident; nay more (and this is its most valuable feature), the latter entirely prevents the possibility of rejection at public examinations; for, as the professors would thus be made acquainted from week to week, and from day to day, with the exact knowledge and advancement of every pupil, no one could present himself to the Board, before he had completed the course of study prescribed at the school we seek to establish, or without having arrived at a perfect knowledge of each subject, because he could not be admitted from one class to another, until he had been examined, and his fitness fully proved—in short, until he had learned the whole business of that class. It will therefore, be at once seen, that though he may learn even by the present imperfect system,—by that now proposed, he *must* learn, or his neglect and ignorance be at once detected, and suitable admonition or other measures be resorted to, even though they should include his dismission from the Institution; for it is

utterly useless to institute any system, unless all parties are compelled to abide by the rules necessary to carry out its objects, and to perform the duties it requires.

The great end we have in view, is the public good. How our humble endeavours may attain it, by this attempt to establish a rational system of education, will be made manifest in the following columns.*

The first portion of the method consists in dividing each subject into CLASSES (taking, for example, Anatomy, as it is given in the sequel), and again to subdivide these classes as minutely as possible.

The next step is, to have a set of printed CHARTS or CARDS containing just as much matter as can well and easily be acquired each day; allowing, at the same time, for the other studies which belong to professional education; the amount of matter on each day's chart being regulated by the whole number required for the course of anatomy. This chart being learned by the time at which the class meets again, the pupils will be required individually to repeat to the examiner appointed, and to demonstrate all the parts and circumstances connected with each particular point, on the bone or recent subject, the dry or moist preparation, as the case may be. If the pupil thoroughly know it, he delivers up his chart, and receives another; if not, he keeps it another day; and if his deficiencies are but few, he may receive another, but never more than two.

The office of daily examination is to be deputed to the pupils in turn; so that each is made to demonstrate. Thus, while he is himself learning, he is made to assist others less advanced; and by this means is maintained a regular system of reciprocal teaching and learning.

At each daily course of instruction, however, the professor is to be present; and, on his daily inspection, he will have a perfect knowledge of the proficiency, or inattention, of every pupil committed to his care, and will thus be enabled to encourage the one, and correct the other.

The business of the daily examiner is to put the word "Absent," against the name of such pupils as do not attend; to see that none of the daily charts are undelivered; and to enter all that are not delivered at the daily attendance. The examiner is also to record in a book the progress of each pupil; and, if he have made more than two omissions, to state these, in order next day to see if they are then known to the pupil.

At the time of delivering the charts or cards the person entrusted with this office is, if the subject be anatomical, to demonstrate all that each card contains, on the natural parts. If it be a subject of chemistry, he is to illustrate the facts by experiments, and to explain all relating to them. In the medical and surgical departments, it will be the duty of the teacher, on each succeeding day, to deliver to the pupils of each class, the history and treatment of the accidents which befall thosep arts, and the diseases which affect those functions, the knowledge of which they have previously acquired. This is all the lecturing admissible into this system of teaching.

When the pupils of any class have acquired the knowledge which is its object (of the bones for instance), they enter another class (that whose object is the ligaments), and so pass on, until they complete the whole of the classes in the course of instruction; at which period they receive from the professor a certificate of attention and proficiency, in order to entitle them to appear before the public examiner, whose duty it is to act between the candidate and the public, as the judge of the one, and the conservator of the interests of the other.

On the Saturday of each week, it will be the duty of the demonstrator of the day, assisted by others (for, as already said, one will be appointed for each day), to make recapitulatory examinations of the pupils, as to their knowledge of the week's business, to render up to the professors an account of each pupil's progress, as recorded in the book which is kept for such purpose, and which contains an account of the mistakes made by each pupil, in his examinations. If they exceed more than two or three in each day, or by their frequent recurrence evince a want of due attention and perseverance, the pupil must either employ additional time to keep pace with the class, or he must suffer degradation.

To such a method of teaching, no one will

* Although some portion of this plan was given in a former number, we consider it best to repeat it here, in order that our readers may have the whole system before them in a connected form.

hesitate to submit, but those who, under the present one, would avail themselves to the utmost, of the opportunity it affords for inattention and idleness. It is, therefore, for these especially that such a check is requisite. By the assiduous and steady pupil, it will be hailed as a boon; while the careless one, on the contrary, will be made to feel that he cannot trifle or neglect with impunity, or without detection and remonstrance.

In order to effect rapid and sure progress in the prosecution of all studies, nothing is so essential as simple and natural arrangement. In medical studies, this is especially requisite, in consequence of the great diversity of subjects which they necessarily embrace. In no kind of study, however, has simple and natural arrangement been so little adopted.

Botany, which considers the external form and internal structure of plants, is often preposterously studied after materia medica, which explains their applications; the practice of medicine is often, with equal absurdity, studied before the theory upon which it ought to be founded; and, with not less absurdity, whatever portions of the practice of medicine have in them any thing of mechanical operation, are arbitrarily and most unnaturally patched together under the name of surgery, although they cannot possibly be either separately studied or separately practised.

Even in the general plan of study, there are numerous other mistakes every day committed, not less important than these. To enter into their particular enumeration, would not be an agreeable task, and may be advantageously avoided by delivering a general method, which is at once simple, natural and impressive.

GENERAL ARRANGEMENTS OF STUDIES:*

I. Mineralogy and chemistry; botany, vegetable anatomy and vegetable physiology; and zoology, anatomy and physiology, which refer entirely to health, if all introduced into a course of medical study, ought to be studied before any of the sciences which refer to disease, and which I shall subsequently mention. They ought also to be studied precisely in the order in which they are here enumerated.

1. Mineralogy, if studied, ought to be studied first, because minerals are more simple in their structure than either vegetables or animals, and also because they afford the materials of which these are composed. It ought even to be studied before chemistry, because it affords the fundamental subjects of chemical operation.

2. Chemistry ought to be studied immediately after mineralogy, because it considers the actions of the substances of which mineralogy merely describes the structure; and, as it is thus so far dependent on mineralogy for its subjects, it necessarily, along with it, precedes botany.

3. Botany, if studied, ought to be studied immediately after mineralogy and chemistry, because it considers the bodies which are next in simplicity, and because the vegetable objects which it describes owe their elements to mineral substances. It ought to be studied before the sciences which refer to animals, because they consider objects which are more complex than its subjects, and also because the subjects of botany afford many of the elements which enter into the formation of the animals which these sciences consider. It ought also to be studied before vegetable anatomy, because the external form of plants should be understood before their internal structure.

4. Vegetable Anatomy ought to be studied immediately after botany, because the internal structure ought to be studied immediately after the external form of plants is understood. It ought to be studied before vegetable physiology, because the actions of the parts of plants cannot be understood before their structure is explained.

5. Vegetable Physiology ought to be studied immediately after vegetable anatomy, because it considers the actions which the previously understood structure performs; and, as it is thus immediately dependent on vegetable anatomy, it necessarily, along with it, precedes animal anatomy.

6. Zoology ought to be studied after botany, vegetable anatomy and vegetable physiology, because it considers the bodies which are next in simplicity, and because the animal objects which it describes owe their elements, directly or indirectly, to vegetable substances. It

* The Latin and Greek classics, ought, as a portion of elementary education, to precede all medical studies. But to ensure knowledge of this kind to the student of medicine, proper persons should be employed to aid pupils, if deficient—especially in medical Latin.

ought to be studied before anatomy, because the external form of animals, which it considers, should be understood in a general way before their internal structure.

7. Anatomy ought to be studied immediately after zoology, because the internal structure ought to be studied immediately after the external form of animals is understood. It ought to be studied before physiology, because the actions of the parts of animals cannot be understood before their structure is explained. Comparative Anatomy presents to us nature's innocent experiments, in which no torture is inflicted, no function is deranged, and no blundering conclusion can well be drawn.

In Anatomy, the muscles are sometimes described before the ligaments, although it is impossible to understand the actions which the muscles actually perform without previously knowing the motions which the attachments of the ligaments permit. The arteries are often described before many of the viscera, although it is impossible to understand their course without previously knowing the structure of these viscera. The arteries are always described before the absorbents, although, did the absorbents not precede them both in existence and in action, the arteries would be destitute of blood. But I need enumerate no more errors of this kind: they are within the reach of every one's daily observation.

In anatomy especially, a better method of teaching is of the highest consequence, as it is indispensable to a knowledge not only of surgery, but of medicine; and this will be successful only by the employment of such a system of teaching, that its facts, if studied, must be acquired, and the teacher daily apprised of the exact progress made, or of any inattention or neglect of the student. That this noblest of all the sciences claims especial attention is evident, as, independently of its value to the physician or surgeon, bringing him into full acquaintance with the means by which "we live, and move, and have our being," and enabling him to understand with accuracy, to relieve with surety the afflictions of his fellow-man, and to obtain for himself well-merited reputation and reward; it is in every respect, of all knowledge the most essential and important. "The proper study of mankind is man."

No order, however, of studying anatomy and physiology is advantageous either to the teacher or the pupil, except the natural one. That is, the organs and functions termed locomotive ought to be described first; next, those named vital; and, lastly, those denominated mental. Under the locomotive, ought first to be explained the bones or organs of support; secondly, the ligaments or organs of connexion; and, thirdly, the muscles or organs of motion: under the vital, ought first to be explained the absorbing surfaces and absorbents or organs of absorption; secondly the heart, lungs and blood-vessels or organs of circulation: and, thirdly, the glands and secreting surfaces or organs of secretion: under the mental, ought first to be explained the ear, eye, &c., or organs of sense; secondly, the brain or organ of perception, &c.; and, thirdly, the cerebellum or organ of volition.

Although this general arrangement, proposed nearly forty years ago, has never been generally adopted, yet every deviation from it is no less a deviation from the natural and the most advantageous method of study.

8. Physiology ought to be studied immediately after anatomy, because it considers the actions which the previously understood structure performs; and, as having a reference only to health, it necessarily immediately precedes the following series of sciences, which refers to disease.

II. Pathology or the theory of diseases, morbid anatomy, materia medica and pharmacy, the practice of medicine, surgery and midwifery, which refer entirely to disease, ought to be studied after the sciences which refer to health. They ought also to be studied precisely in the order in which they are here enumerated.

1. Pathology, of all these, ought to be studied first, because it affords the basis of all subsequent procedure. It ought also to precede morbid anatomy, because it explains those actions which terminate in the states described in morbid anatomy. Pathology may, therefore, be thus considered as regarding causes, and morbid anatomy as regarding effects; though these effects become causes in their turn.

2. Morbid Anatomy ought to be studied immediately after pathology, because it describes the various states which are induced by the actions considered in pathology, and which in their turn induce new actions. It ought also to be studied immediately before materia medica, &c., which refer to the removal of these states, because the states must

be understood before their removal can be rationally thought of.

3. Materia Medica and Pharmacy ought to be studied immediately after morbid anatomy, because they afford the means of removing these states. They ought to be studied before the practice of medicine, because no practice can be adopted without previous possession of these means.

4. The Practice of Medicine and the Operations of Surgery ought to be studied immediately after materia medica and pharmacy, because their use ought immediately to follow the possession of the means.

5, and 6. Surgery and Midwifery may be regarded as branches of Medical Practice.

With regard to THE TIME WHICH THESE STUDIES OUGHT TO OCCUPY, three or four years may suffice.

In the winter of the first year, ought to be studied mineralogy and chemistry: in its summer, botany, vegetable anatomy, and vegetable physiology.

In the winter of the second year, these sciences ought to be reviewed; and zoology, anatomy, and physiology ought to be studied. The review of the preceding year's studies will occupy little time; zoology, generally considered, will not occupy much; anatomy and physiology will be entitled to the greatest share of it; and actual dissection will be so in an especial manner. Nor is this period, if both lecturer and pupil do their duty, by any means too short for considerable advance in these sciences. The summer of the second year ought to be occupied with the continued review of the preceding sciences, especially with the last—anatomy, comparative anatomy and physiology, with dissections; and pathology and morbid anatomy ought now to be studied.

In the winter of the third year, the preceding sciences ought still to be reviewed, especially anatomy, comparative anatomy and physiology, with dissections, and also pathology and morbid anatomy; and materia medica and pharmacy, and the practice of medicine, ought now to be studied. The summer of the third year ought to be similarly employed. And, during the summer (if not the winter) of this year, an hospital ought to be attended.

Those, who can employ four, instead of three years, ought to employ the last in a continued revision of preceding studies, and especially in attendance at an hospital; so that the period of actual practice may be enlarged. To attend an hospital, however, before the study of the practice of medicine and surgery has been begun—that is, in the third of a three years' course of study, such as I have described, is utterly useless, except to those who may have previously studied at another school or university.

Under the system, then, of daily, gradual, and progressive instruction here described, the pupil would with facility gain ample, well-arranged and satisfactory knowledge, would soon become satisfied with the advancement he had from time to time made, and would give assurance to those entrusted with the direction of his scientific education, of the proper employment of his time in the various departments of his profession.—Under this test of daily examination, the professor may become acquainted with the moral occupation and progressive advancement of his pupils, and thereby be able, not only to check such impropricties of habit as may otherwise become fixed and established, but to cultivate and confirm in them the conduct and habits of gentlemen.

Instead of the barbarous system of apprenticeship, the youth who selects medicine as his profession should at once commence his studies according to the method here stated, which, instead of wasting five years, may, in four years, complete for him a regular and profound course of education in every branch of science relating to medicine and surgery; following in succession the plan given for each subject, in strict observance of the previous "lucidus ordo."

With regard to HOSPITAL ATTENDANCE, I may here observe, that the surgeon requires surveillance, as well as the pupil. It is much to be desired that a strict eye were kept upon the way in which patients are treated, particularly on days of admission at hospitals and dispensaries, and that all cases were reported wherein patients are made to wait some three or four hours until the medical officer arrives, though their diseases are often such as to be encreased by exposure to cold, &c.

As to EXAMINERS, they ought to be chosen from among medical men retired from practice, and unfettered by its urgent duties and inevitable anxieties; they ought to be perfectly independent of all occupation disqualifying them for this office; and their time ought to be devoted solely to testing the knowledge and qualifications—the fitness or incapacity of the

candidate to undertake the duties of his profession. They would thus be placed above the suspicion of partiality. When indeed the importance of these sciences, and their practical application to the vast and sad catalogue of human afflictions, are duly estimated, it will be evident, that the best system of teaching them, and that of giving ample and perfect satisfaction to a duly qualified Board of Examiners, is at once a protection to the honor and character of the healing art, and a duty to mankind.

To remedy the errors of the examinations, I have formed a plan founded on the system I am here inculcating—a plan which at once rids science of those useless automatons, the examiners, and them of their irksome task, as well as of the odious position of being often the objects of suspicion, either of partiality or of the indulgence of ill-temper. I have before said, that not mere *presumption* of qualification is sufficient, but that absolute proof is demanded, and that the examinations must be such, in point of quality and minuteness, as to satisfy the public that the knowledge of the candidate is perfect and complete. Instead, therefore of a few extemporaneous questions being deemed sufficient, a systematic table of examinations ought to be kept, and one also of the answers to be given with which are to be compared those returned in writing by the person under examination. It is quite clear, that if on such a plan as this the pupil were rejected he could have no one to blame but himself, nor to feel that any one else has had any share in his degradation. By this method the obnoxious practice of Final Public Examinations would be for ever abolished, which are as useless and idle as they are cruel and destructive of the future happiness, prosperity, and dignity of those who have had the dire misfortune, under this mistaken and worthless system, to be sent back to renew their studies, and who will ever feel that, although they may ultimately be admitted, the stigma is never entirely removed. In the stead of these mere farces—displays of mummery—ought to to be adopted, weekly or monthly examinations, consisting of a full systematic and written table on each particular subject, comprising a minute detail of the facts and doctrines of the science. To these, written replies to each question are to be made by the candidate, due care being taken that he possesses about him no document whence to borrow the required knowledge; and such a mode of frustrating the object can effectually be prevented, by the presence, during his probation, of a proper person employed for the purpose in each department of science, the knowledge of which is required to be attained by the pupil. A plan, like that I have here developed, would for ever exterminate the mass of evil fostered by the present method, and in a pre-eminent degree advance the honor, dignity, and independence of the profession, and give to the public perfect and lasting satisfaction and security.

It may be urged, we must admit, that these tables of questions and answers will get into the hands of students, who may thus prepare themselves for the occasion.—Well, so much the better: they will be profoundly versed in Medicine and Surgery!

I am fully aware that this attempt to put down a worthless system, and erect in its stead one founded on reason, will draw upon me the odium and obloquy of the adherents to that which is recommended only by its suitableness to their purposes and advantages; these, however, to me are matters of the most ineffable unconcern. Having utter abhorrence and contempt for the quackeries, juggling, and ignorance with which medicine at present abounds, and for the foppery, and cupidity, and monopoly which lecturing so aptly assists, and being placed totally out of the reach of selfish, conflicting, and malignant interests, I cannot be injured by the opinions of such parties in the remotest degree. I remain in perfect confidence and security as to the success of the method I propose, and in full certainty of its benefits to science and mankind, to whom alone I look for approbation.

(*To be continued.*)

ADULTERATION OF TOBACCO.

BY CHARLES WATT, JUN.

It has now become a practice among dealers in the various commodities of life, to adulterate the goods in which they trade to the greatest extent in their power; but should the article be one which will not admit of adulteration, they turn their attention to the discovery of some method by which the article is rendered more easily destructible. The adulteration of which I am about to treat is one more especially of this description, though it is operated on to some extent in both ways.

Formerly, cabbage and lettuce leaves dried, chopped, and steeped in a decoction of tobacco, were the adulterating substances most in vogue with this class of persons; but the public have become aware of this fraud, and therefore it cannot any longer be practised with advantage. I do not mean to say that it is quite out of use; but tobacco, so adulterated, burns with an unpleasant odour, and is so reduced in strength that the consumer detects the fraud: moreover, it burns with a black ash instead of a white one as is the case with pure tobacco; and as this is the criterion by which all practised smokers judge, the dealer has been obliged to adopt some other mode of increasing his profits, and which is in most cases the following:—

A saturated solution of nitrate of potassa is made, and the tobacco is moistened with it. By some parties the tobacco is partially dried after this operation, but by far the greater number send it out without even doing this. This adulteration operates beneficially to the dealer in two ways: in the first place, it causes the tobacco to consume faster, by supplying oxygen; and in the second place, it enables him to add more water than he could otherwise do.

This adulteration may be detected by drying a piece of the suspected tobacco, placing it on a plate and setting it alight: if it contains nitrate of potassa; it will burn more brilliantly in some parts, than in others, and it will likewise sparkle as it burns.

Tobacco naturally contains a small portion of this salt, but the quantity is too minute to be detected by the above means.

It has long been a matter of dispute among medical men, whether the fumes of tobacco are injurious or not; but they do not seem to have come to any decision on the subject; however, it has never for a moment been doubted, that the fumes of binoxide of nitrogen, which are given off during the combustion of nitrate of potassa in contact with carbonaceous water, in the combustion of the tobacco in question, must be highly injurious; for directly the binoxide of nitrogen is brought in contact with the air in the mouth, lungs, &c., it is converted into nitrous acid, than which there cannot be a more injurious compound; and though it may be argued that the quantity is but small, yet it is to be considered that the quantity, however minute, is being constantly applied.

I therefore consider this adulteration one of a most cruel nature: not only does it defraud, as these adulterations generally do, the laboring classes in particular, but it injures their health: some stop ought to be put to the perpetration of such villany, and the punishment merited by the perpetrators insured to them.

It is really somewhat surprising that in the 19th century, such abuses should be allowed to exist; but it is no less true than lamentable, that scarcely an article can be named which is not by some means or other adulterated. And I believe this article, which may almost be considered one of the necessaries of life to those who indulge in the habit of smoking, comes in for its full share.

Besides the adulteration of which I have spoken, tobacco is subject to many others, such as chloride of sodium, and, in some instances the nitrate of soda is substituted for the nitrate of potassa, to lay which before the public, I am now engaged in some experiments on this article, in the hope that I may be in some measure instrumental in awakening attention to the treatment which they receive at the hands of the dealers in the various articles of commerce. Should I succeed in my endeavour, it will be to me the greatest recompence I can receive for any trouble I may take on this or any similar subject I may lay before the readers of "The Chemist;"—in fact exposing imposture is at present the only method which can be adopted to check it; and when these manufacturers find that their trade is falling off, they may at the same time be compelled to acknowledge the truth of the maxim, that "honesty is the best policy."

INUTILITY OF THE PHARMACEUTICAL SOCIETY TO COUNTRY DRUGGISTS.

Edinburgh, 16th Oct. 1841.

Gentlemen,—

In the last number of your journal, there were a few remarks, entitled "Inutility of the Pharmaceutical Society to Country Druggists," upon which I would crave the liberty of offering some observations, more particularly as I think your correspondent has distorted the exertions of the Society, and has taken some prejudicial notions regarding it.

There are some passages in your correspondent's letter which are not a little sarcastic, and calculated to bear against the infant society in the eyes of all country and provincial druggists. Were these insinuations just, we could not blame the "Country Druggist" for shewing forth to his brethren the fallacies of this institution,—nay, we should be ready rather to commend him for his exertions in the cause of truth. At the very outset of his epistle we are told, that he rejoices at the rise of the Pharmaceutical Society, but then he immediately laments, "that its progress is *not* more *marked* and *distinct*." Now the whole tenor of his letter appears to be, the attempt to prove that the present rate of subscription is too great, and that its objects are too *extended*. This is somewhat contradictory, if we compare the two statements. If your

correspondent will but retrospect the actions of the Society since its very recent establishment, he cannot fail to be pleased, unless indeed he supposes, that the council should be possessed of the far-famed cap of Fortunatus, the placing of which upon the cranium of the chairman, with the request by the other members, that he would express such and such laws, would be instantly followed by the execution of the so inwardly formed idea. I cannot think what are his objections to the name of the Society, for, as Juliet has it, "what's in a name?" Besides, had the parties forming the Society sought the English language throughout, they could not have found a *plainer* or more *appropriate* title than the one given to it. Your correspondent says, within a parenthesis, "great name this." Is it not, strictly speaking, a *Pharmaceutical Association*, and is it not intended in its ramifications to extend over *Great Britain?* Where then is the vanity of calling this association by its proper name? As well call the department of medicine a misnomer, which includes the compounding of drugs, and which has been entitled Pharmacy. We well know that it has been the attempt of chemists and druggists on both sides of the Tweed, to unite themselves into a body, and improve themselves, well knowing their comparative illiterate condition, and observing daily the encroachments made upon their rights and privileges. But we are also aware that their endeavours have been abortive, their most powerful efforts have turned out a rope of sand. And when we have a prospect of something based upon a substantial foundation, ere the lowest stone in the building has been well laid, we have the puny efforts of an individual to overthrow the whole structure.

Great weight is laid upon the remark, that the London Druggists are better educated in scientific matters than country or provincial druggists. The truth of this I deny in toto, for I hold an opinion diametrically opposed to this, and one founded on observation. Whatever chemists in London *may hereafter* be, *at present, generally* speaking, they are less conversant with Pharmaceutic Chemistry, than provincial young men. This is at first sight quite paradoxical, particularly when we recollect the great and frequent opportunities afforded by numerous talented gentlemen, lecturers on science. But then, on the other hand, let us bear in mind that London is perhaps the greatest commercial city in the world, and that young men engaged in business have no time to spare either to study, attend lectures, or experiment. Nay, for many months in the year it is with difficulty half an hour can be snatched for meals. Perhaps this is unknown to the "Country Druggist," who hits so severely at the Pharmaceutical Society, but I can assure him that I have practically experienced what I have asserted.

It is allowed that the Society has done one good act in successfully opposing the obnoxious bill of Mr. Hawes. Having gained one victory, it was the very circumstance which ought and has stimulated us to renewed exertion, and our concentration and stability now depend upon the united co-operation of all chemists in England and Scotland. Before we condemn this institution, let us see how it will work: a very few years will give us some notion of its merits; while our 2*l.* 2s. will be well spent, were it for no other purpose than that of assisting to pay the expenses incurred by the late Parliamentary opposition. That has gone, but we do not know what may yet come; let us, therefore, be on our guard. There is an old Scotch saying, "Fules and bairns should na' see half-dune wark;" let us profit by this, and not endeavour to strangle the infant at its very birth. I am probably at a greater distance from London than your correspondent, and perhaps can as little afford to contribute my mite to the institution; yet, I cannot close my eyes to the good likely to accrue, after the Society shall have been in operation for a little time.

The Society is much blamed for not being "chartered or recognized by the Legislature;" but here your correspondent puts the cart before the horse, because no legislative assembly would grant protection to a body of men, until they had given proof of being capable of managing themselves as a corporate body. Parliament is not a physician, who, upon being applied to, will at once, and without reflection, grant a recipe. Proof, and strong proof, must be yielded, of fitness, to be worthy the countenance of the Legislature of this country, ere we can be chartered. Let, therefore, the prospect of this rather stimulate us to renewed exertion, than damp our ardour.

The power of writing M.P.S.G.B. at the end of the name of members, is looked upon with much contempt by your correspondent. It is true that EXISTING druggists can at the present time obtain this privilege upon payment of a fee; but after a certain date, those who enter the business will be required to pass an examination, and obtain the Society's diploma ere they can commence. But supposing it otherwise, how many societies are there into which you can be admitted by paying a sum of money? The Society of Arts (F. S. A.), the Botanical Society (M.B.S.), and the Geological Society (F. G. S.), are instances of this.

We do not as yet know how many good branches may be given off from the parent stem, but as a root must somewhere exist, why not let it be in London, from whence we may imbibe a share of instructive sap and nutriment? There is a field there, and concentration of talent, amidst which this Society is more likely to flourish, than if carried into some of the Midland counties, where it

would be more likely to die a lingering death, than live in honour and prosperity.

Your correspondent's quotation is very apropos to this subject, and as all must admit its truth, although couched in strong terms, it forms one of the very best arguments we could use for the formation of the Pharmaceutical Society of Great Britain. I refer to the following, from Dr. G. O. Rees' work on the Analysis of Blood and Urine:—"The existence of such a body as the untaught tradesmen, who arrogate to themselves the title of Chemists, remains as one of the most amusing absurdities of the nineteenth century."

Let us hope that, by our united exertions, we may shake off this stigma, and let it henceforth recoil on those who shall use it; and, in conclusion, allow me to subscribe myself a friend to medical reform; and although so far north as to come under the denomination of a Scotch Druggist, I am yet not ashamed to add—

M. P. S. G. B.

ASSISTANTS' SUBSCRIPTION TO THE PHARMACEUTICAL SOCIETY.

Sir:—

The reformation which is now being planned among chemists and druggists is an event which they all should hail, and to which all should lend effective aid, in order to bring it to a successful termination; intended as it is to raise the character of the trade, to set it on a more secure basis, and to protect it against the encroachments of unqualified persons. Their being united together in one body will form such a concentration of talent as cannot fail to promote the advancement of pharmaceutical science, to place us in a position to dispute with the French the fame which they have so long enjoyed as the first pharmaceutists in the world, and to raise us in this science to a rank worthy of our attainments in the others.

The advancement of science and the diffusion of letters have removed from the public mind the superstitious ideas which it formerly associated with the compounding and practice of medicine: we now no longer invest it with an air of mystery, nor employ those cabalistic figures, which the old apothecaries used *ad captandum vulgus*, and, instead of

"A beggarly account of empty boxes"—

handsome and well-filled shops are met with in every town.

But still with all the tinsel and outward show which chemists' shops of the present day exhibit, it must be confessed that with many, a knowledge of pharmacy is at a very low ebb, and even the first principles of chemistry not understood. To remedy this evil is the primary object of the Society, and too much praise cannot be given to those who have executed the scheme of its foundation.

But in a pecuniary point of view a serious obstacle exists to its ultimate success, and which, if not obviated, will nullify all past exertions. Whilst I succumb with all due respect, to those who have brought the Society to its present state, and who have doubtless studied it in all its bearings, still it is my opinion that the amount which they demand as the annual subscription of assistants and apprentices, is much too great: half the sum would certainly suffice for all the purposes contemplated, and to enable it to carry on its operations on a scale becoming its title as "The Pharmaceutical Society of Great Britain."

The chemist's assistant, "*parva laborum præmia ferens*," after having supplied his necessary and immediate wants, seldom possesses money to lavish in unnecessary expenditure, and the sum stipulated will be extremely burthensome to the majority, and irksome to all.

As this is also the general opinion, it is to be hoped that the committee will take the matter into consideration; for by lessening the subscription they will assuredly accelerate the completion of their design, and obtain the cordial co-operation of all parties.

I am, Gentlemen,
Respectfully yours, &c.,
Αλφα.

PATENT MEDICINE LICENSES.

To the Editors of The Chemist.

London, Oct. 1st, 1841.

Gentlemen,—

The season has returned for the payment of 2*l.* license for the sale of patent medicines, by those who have the very questionable advantage of trading within the limits of the two-penny post. Can any of your subscribers explain the equity of the tax, when the license at Liverpool, Manchester, and every great town in England, is only 10*s.* 6*d.*, and if without the limits of a borough town, only 5*s.*? It is to be further borne in mind, that tradesmen in the country deal in a more general stock; a greater variety of articles are usually sold by them, and they are every way capable to pay an equal tax with the outnumbered druggist of London. An union of the druggists of the metropolis for a fair adjustment of the patent medicine licenses, would be one of the most useful and legitimate which any class could form. The profits upon patent medicines do not exceed twenty per cent., and out of the sale of patent medicines 40*s.* are to be paid. There may be a tolerable number who may sell more than 40*l.* worth of *patent* medicines a-year; but the great bulk of the patent medicine vendors

of London, I sadly fear, do not accomplish it. Surely some effort should be made to call the attention of the commissioners of stamps to the severity of this tax upon London tradesmen. I am, Gentlemen, one of the old school, and

A Subscriber.

CHEMISTS AND DRUGGISTS AN UNRECOGNIZED BODY!

To the Editors of The Chemist.

Gentlemen:—

It would appear that chemists and druggists in general feel greatly flattered by the often reiterated taunt of their want of recognition, from the readiness with which all echo and adopt the assertion, who have either said or written any thing upon the subject of their present condition, tacitly admitting its validity.

I ask, what is meant by the assertion? Is it that they are not recognized as a scientific body,* or does their want of recognition consist in the practice of pharmacy not being classed amongst the professions? I answer, in the latter case the distinction is a mere bag of moonshine, and, for my own part, I am content to retain the substance, leaving to those who delight in titles, the possession of the shadow; or in other words, give me the tangible benefits herein enumerated, which constitute a recognition of the trade, in preference to the empty title of Professor.

I think the failure of the late attempt at interference with the privileges of chemists and druggists, should be admitted as proof that they are at least recognised by the legislature. The fact of a member of the trade holding an appointment as chemist and druggist in the medical department of Her Majesty's household, is sufficient evidence of their recognition by the crown. That they are recognised by the whole body of physicians and consulting surgeons, as the legitimate compounders of their prescriptions, cannot be denied, as it is their invariable practice, on the question being put, as to whom they are desirous of its preparation being confided, to recommend a chemist as the dispenser; and doubtless it is with difficulty they can dissemble their chagrin and disappointment on the apothecary in attendance, or as he is commonly called, "the family doctor," taking possession of the recipe, knowing full well that their endeavours to restore the patient will in all probability be frustrated either by the careless or surreptitious compounding of the same. That chemists and druggists are recognized by the "general practitioners," is equally apparent, from the jealousy with which they view the superior performance of the duties connected with the departments of pharmacy, by their calumniated rivals, a circumstance to which in great measure is to be attributed the hostility at present evinced towards them. The last class, though by no means the least in importance, by whom chemists and druggists are recognized, is the public. So much for their want of recognition.

Gentlemen, in the above observations, I have endeavoured to refute the statement with which this article is headed, according to my definition of the term; also to prove the accusation to be a gross libel on the public and the trade, which seems to have been imbibed as eagerly as it has been disseminated. I trust I have succeeded, and remain,

Yours very respectfully,

Pharmacopola.

* It is for them to prove their title to be distinguished as a scientific body in future.

ADVERTISING CHEMISTS.

To the Editors of the Chemist.

Gentlemen:—

I very much approve of the remarks made by your correspondent, *Pharmacopola*, in your last number.

Now that we have a Pharmaceutical Society, and a recognized organ, well known by its appropriate title—The Chemist—it is the fault of chemists and druggists themselves, if they do not by every means discountenance and denounce those mercenary scoundrels, who, to benefit themselves in one degree, do not hesitate to injure the general trade to an amount and proportion of perhaps 8 or 10 degrees.

I would not confer any additional honor in noticing the "respectable individual" alluded to in your correspondent's note, otherwise than by enquiring if the same party is not a manufacturer of "Indian Rubber" Court-Plaster? If this said manufacturer is the identical person who advertises his "first-rate" *articles* for "Families and *Invalids*"(*!!!*) do the chemists and druggists act consistently with their interests, or the principles of respectable trade, by countenancing either him or his manufacture?—Yours truly,

A Member of the Pharmaceutical Society.

P. S. I have my eye on sundry other gentlemen of the craft, who will do well to reform, or their actions shall be made as notorious as they are already unprincipled.

CORRECTIONS OF THE POCKET FORMULARY.

To the Editors of The Chemist.

Gentlemen:—

I shall be greatly obliged by your allowing

me, through the medium of your widely circulated periodical, to point out two or three errors which I have lately discovered in the *Pocket Formulary*—a little work which was favourably noticed in your January number. Few as they are (considering that the work contains more than six hundred formulæ), I think it right to afford the purchasers of the work an opportunity of correcting them; and as the greater part of the impression is already disposed of, it is too late to do so by inserting a list of errata in the book.

It is no agreeable task for an author to proclaim the imperfections of his work; but, in so doing, I am adopting a course which I am most anxious to see followed, in similar circumstances, by authors of more established reputation, and in regard to works of more authority and importance.

Page 11, line 16, for *prunes* read *sloes*.
„ 44, „ 4, for *zingib.* ʒj read ʒij.
„ 44, „ 4, for *Ammoniaci* ʒj read ʒij.
„ 70, „ 7, for *one part* read *one ounce*.

There are also several trifling literal errors, which, as they are not likely to lead to any practical mistake, need not be noticed here.

I am, Gentlemen,
Your obedient Servant,
THE EDITOR OF "THE POCKET FORMULARY."

EFFICACY OF IODINE AND ALTERATIVE DOSES OF MERCURY, IN THE CURE BOTH OF THE PRIMARY AND SECONDARY SYMPTOMS OF THE VENEREAL DISEASE.*

BY JOHN WICKENS WEST, M.R.C.S.L.

CASE I.—Elizabeth Foster, æt. 33, became a patient of mine about four months ago. She was labouring under violent pains in her limbs, more especially at night, which deprived her of sleep, ulceration of the tonsils, and a large swelling over the tibia of the right leg, and another on the os frontis, both of which were very painful to the touch: in the course of a few days after I first saw her, both swellings were in a state of ulceration. She stated that she had contracted the primary symptoms about two years before, but of which she got cured without much difficulty. After some time she was attacked with pains in her feet, elbows, and shoulders, with a constant inclination to vomit: these symptoms lasted for some days, and then an eruption appeared on the breast and arms. This was quickly followed by sore throat and pains in her limbs, especially at night. She took a variety of medicines prescribed by various practitioners, but still the symptoms increased. I ordered her the following.—

℞. Tinct. iodinii ℳxv. ex cyatho aquæ ter quotidie.
℞. Pil. Hydrarg. gr. iss.;
Pulv. Doveri, gr. iij.;
Conf. Rosæ q.s. ut fiat pil. nocte maneque sumend.
℞. Solut. Chlorid. Sodæ, ʒiss.;
Aquæ Puræ, ʒiv.
Fiat gargarisma frequenter in die utend.

I continued this plan without the slightest alteration, for two months, during which time the symptoms generally improved, and at length entirely yielded. The ulceration of the tonsils, and the sores on the leg and forehead, healed. The pains in the limbs ceased. She passed quiet nights, her health quickly improved, and she is now quite recovered.

She had not left her bed, except for a few minutes at a time, for three-quarters of a-year; and her house for more than two years.

CASE II.—A gentleman applied to me in May, 1840, with a large chancre on the glans penis, which he had caught a month before, and for which he had been taking mercury ever since: its character was unhealthy, with a hard base and considerable irritation of the surrounding parts. He had lost his appetite, and was suffering from debility to a very great degree. I prescribed the following mixture:—

℞. Sulph. Quininæ, gr. vj.;
Acid. Sulph. Dilut. ʒiss.;
Inf. Rosæ, ʒvj.
Fiat mist. cujus capiat cochl. duo magna bis quotidie.

His health considerably benefited by this plan, but the chancre remained unhealthy, and without any disposition to heal.

A month after I first saw him he complained of sore throat, which was followed by a copper colored eruption on his body; the chancre continuing the same, I determined on giving him—

℞. Tinct. Iodinii ℳxv. ex cyatho aquæ ter die sumend.

He came to me a week after he had been taking the above medicine, and I found the sore throat better, and the eruption fast disappearing: the chancre was likewise much improved.

I recommended him, in addition to his medicine, to change the air for a short time, which he accordingly did. He returned in three weeks with his health much improved: the chancre had healed; the sore throat and the eruption had entirely disappeared.

CASE III.—William Monk, æt. 36, called on me in December, 1840, with an eruption on his skin, pains in his limbs, ulceration of the soft palate, and a node on the left shin. He stated he had had chancres two years pre-

* Extracted from *The Medical Gazette* of Oct. 22.

viously, for which he took pills of a druggist, and soon got cured. I ordered him—

℞. Tinct. Iodinii ℿxx. ex cyatho aquæ ter quotidie.
℞. Pil. Hydrarg. gr. iss.;
Pulv. Doveri, gr. iij.;
Conf. Rosæ, q.s.
Fiat pil. nocte maneque sumend.

Nov. 1st.—Has been taking the above for ten days, and finds the pains in his limbs relieved, and the eruption less, but the other symptoms as before.

12th.—The ulceration of the palate healing, and the other symptoms entirely removed.

18th.—Quite recovered.

Case IV.—William Hewlitt, æt. 22, contracted the primary symptoms of syphilis in April 1839. He had an unusually large chancre, which involved nearly the whole of the glans penis. The glands in the groin were enlarged, and very tender and painful. I prescribed for him the following:—

℞. Pil. Hydrarg. gr. iij.;
Pulv. Doveri, gr. iv.;
Conf. Rosæ, q.s.
Fiat pil. nocte maneque sumend.

He persevered in the above for some time without much alteration in the state of the chancre, and I then administered iodine, which, in conjunction with the pills, had the effect of soon recovering him.

Case V.—William Martin, æt. 52, consulted me June the 10th, 1840, in consequence of an ulceration at the back part of the fauces, leprous eruption on the legs and arms, and a painful swelling on the tibia of the right leg. He informed me that, about two years ago, he had chancres and gonorrhœa, and a suppurating bubo, but which all yielded to treatment.

I prescribed the tincture of iodine and pills, as in the other cases, with equal success; the symptoms disappearing by the end of two months.

Case VI.—J. R., æt. 26, became my patient on the 6th of Sept., 1840, with a large Hunterian chancre near the frænum, and an inflamed gland in the left groin approaching to a state of suppuration. I recommended poulticing the groin, and gave him simply an aperient mixture.

13th.—The chancre more healthy, with a disposition to heal, and the bubo suppurating freely.

June 6th.—The chancre healed, but the ulcer in the groin has spread, and assumed a phagedenic appearance, which continued to increase until the 18th. I ordered—

℞. Tinct. Iodinii ℿxx. ex aqua, ter quotidie.
℞. Pil. Hydrarg. gr. ij.;
Pulv. Doveri, gr. iij.;
Conf. q.s.
Fiat pil. nocte maneque sumend.

The ulcer improved under this plan.

26th.—A small swelling has made its appearance in the right groin, but the ulcer in the left nearly healed. As there is a disposition to ptyalism I omitted the pills, and continued the tincture of iodine.

July 2d.—The ulcer in the left groin has healed, and the swelling in the right subsided.

The cases which I have related are, I think, sufficient to shew that it is the combined influence of iodine and mercury which has the effect of removing both the primary and secondary symptoms of syphilis. In all cases where chancre was present I relied on the constitutional treatment without local applications; and I had the satisfaction of finding it successful. I am aware that iodine by itself has succeeded in curing some severe cases of secondary symptoms; but I do not think it can be so much depended on, in all instances, as when it is given with alterative doses of mercury. The symptoms affecting the general system, where the primary or local disease has not been treated with mercury, it will answer as well.

ON THE EMPLOYMENT OF THE DECOCTION OF SOOT IN A CASE OF SEVERE BURN.*

BY DR. EBERS.

A young girl, about the age of puberty, in an epileptic fit, fell upon the fire. The back part of the fore-arm, all the hand, and the left side of the neck, from the base of the lower jaw to the inferior half of the breast of the same side, were severely burnt, with great destruction of the skin. Amputation of the arm was proposed, but the parents refused permission. The sloughs separated at the end of three weeks. The bones were charred in several places. Notwithstanding the employment of astringents, and a generous diet, the patient began to sink from the profuse discharge. Dr. Ebers then determined to try the effect of the decoction of soot, in the cicatrization of the wound. A handful of soot was boiled in eight pounds of water, until the fluid was reduced to lbij. Lint was then soaked in it, and applied to the granulating surface. The next day, instead of the enormous secretion of pus which had formerly taken place, the lint was hardly wet through; the surface of the sore was red and level; the granulations were depressed, and the circumference of the ulcer was surmounted by a cicatrix of two lines in breadth. In eight days, the whole extent of the wound, with the exception of those points at which the bones were exposed, was

* *Journal de Méd. Pratique de Bourdeaux*; *and London and Edinburgh Monthly Journal of Medical Science.*

covered by a smooth and level cicatrix. Stimulant applications were then applied to the naked bones, and as soon as they were covered by granulations, cicatrization was effected in an equally rapid manner, by the decoction of soot. The patient was cured of her epileptic fits, by the flow of the catamenia taking place.

It seems impossible to deny the effect of the soot in the case just mentioned. It is not likely, however, that it will be found equally successful in the hands of all who try it. If it always has the power ascribed to it here, it would be a dangerous remedy in those cases of suppuration of long standing, in which, from a sudden cessation of the discharge, the constitution is so apt to suffer. It appears to have acted as a stimulant; and it may be useful instead of the nitrate of silver, or sulphate of copper, in cases where they are used to keep down flabby granulations.

FORMULA FOR THE USE OF CREOSOTE IN TOOTHACH, AND AS A WASH FOR THE GUMS.*

BY DR. RIGHINI.

The following substances are mixed in certain proportions:—Alcohol, 16 grammes; creosote, 24 grammes; alcoholic tincture of cochineal, 8 grammes; peppermint oil, 12 drops. This preparation must be kept in a stoppered phial. It may be applied on cotton in the cavities of carious teeth; or a wash for the gums may be formed by adding a few drops of it to a little water.

A NEW REMEDY AGAINST LEPROSY.†

BY M. MERAT.

M. Mérat, at the Academy of Medicine, on the 14th of August, read a report upon a root named Huichunchilly, (we do not guaranty the orthography,) which had been introduced into France by Mad. Ribi, from South America, and which was stated to be exceedingly useful in the treatment of lepra. Dr. Robinson said that it had been attended with great benefit in the treatment of this disease in the Antilles. The price of an ounce was *one thousand* francs!

TWENTY-SEVEN PERSONS POISONED BY EATING DISORDERED VEAL.

About nine weeks since, a farmer named Schofield, residing in the further side of Scotland, had a calf dropped, which he wished to rear, but as it became disordered, he employed a cow-leech, who doctored it about four weeks, at the end of which time it was handed over to a butcher named Kershaw, who killed it, and sold the meat in cheap lots, at 2½d. and 3d. per lb., to people chiefly in the neighbourhood of Whitworth, all of whom were taken more or less ill immediately after eating it. Amongst the rest were a decent working family named Sprawel, to whose share fell the head and mid-calf. The former they boiled for dinner on Sunday week, and, like all the others, they were taken ill the same day, the meat having only been sold on the Saturday. The family consisted of old James Sprawel, nearly 70 years of age, his wife, and several mature sons and daughters; and the old woman was the only one who was not seriously affected by the food, she having only taken a small portion of the broth. James, the old man, began to vomit immediately after he had finished his dinner, and he continued in the same sickly state until Thursday week, when he died. One of the sons, also, at present remains in a rather dangerous condition. On Tuesday last an inquest was held on the body by Mr. Dearden, when, after a patient investigation, a verdict was returned which legally exonerated the vendors of the disordered meat; they were, however, called into the inquest-room and severely admonished, being also informed at the same time that, if another death ensued from a similar cause, it would probably be the painful duty of the jury to send them to Kirkdale, for trial. The number of persons thus poisoned was about twenty-seven.

TO SUBSCRIBERS AND ADVERTISERS.

The Chemist, for the present year, forming Volume Second, will be completed early in December, when our Subscribers are recommended to complete their volumes without delay, to prevent disappointment. The Publisher will give full price to any gentleman possessing numbers I, III, and IV. of Vol. I.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

Erratum. In our last Number, page 308, bottom of column 2, *read* Spermaceti ½ lb. (half pound).

* *Journal de Chimie Médicale.*

† *Gazette Médicale de Paris, 21st August, 1841, and Lond. and Edin. Monthly Journal of Medical Science.*

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THE CHEMIST.

I. CHEMISTRY.

ON THE ACTION OF NITRIC ACID ON STEARIC AND OLEIC ACIDS, AND ON THE PRODUCTS WHICH RESULT FROM IT.*

BY M. C. BROMEIS.

ACTION OF NITRIC ACID ON STEARIC ACID.

M. Chevreul, in his *Chemical Investigations concerning Fatty Bodies*, states that with the aid of heat, nitric acid attacks stearic acid, and that the acid solution deposits by evaporation a substance of a yellowish white, soluble in water, very acid, and containing an acid matter. When one part of stearic acid is treated with two or three parts of nitric acid, with heat, after a little time, a very vivid action is set up, and much binoxide of nitrogen is disengaged, accompanied by another gas which powerfully irritates the respiratory organs. The action very soon subsides, the stearic acid becomes more fluid, and solidifies, forming a mass of the consistence of tallow, and which melts, according to the duration of the operation, between 35° and 40° C.

Margaric Acid.—It is contained in altered stearic acid, mixed with an oily substance, which is easily saponified, assuming a red color.

By removing the nitric acid from this crude product by means of boiling water, and afterwards dissolving it in alcohol, margaric acid is separated and precipitated, in the crystalline state, on cooling. By crystallizing it two or three times in alcohol, pressing and saponifying the product, then decomposing the soap by an acid, a perfectly white matter is obtained, which melts exactly at 60°C., and which presents all the properties of margaric acid. This is fully confirmed by analyses. Indeed 0gr. 4573 of melted acid gave :—

Water . .	0·5123gr.
Carbonic Acid .	1·2475

which furnishes in hundredths : —

Carbon . .	75·43
Hydrogen . .	12·45
Oxygen . .	12·12
	100.00

Calculation gives :—

Carbon . .	75·64
Hydrogen . .	12·71
Oxygen . .	11·65
	100.00

The formation of margaric acid by the oxidation of stearic acid is explained in a very simple manner, by admitting that the latter takes two atoms of oxygen, one of which enters into the constitution of the acid, and the other combines with an equivalent of hydrogen, to form water, which is eliminated.

Indeed we have :—

$$C^{68} + H^{138}, O^7 \left\{ \begin{matrix} \\ - H^2 + O^2 \end{matrix} \right\} = 2\,(E^{34}\,H^{68}\,O^4) + H^2\,O,$$

which corresponds with the composition of two atoms of hydrated margaric acid.

I confirmed this decomposition by the following experiment :—

By treating a small quantity of perfectly pure stearic acid, during half an hour, by concentrated boiling nitric acid, the acid employed was entirely converted into pure margaric acid.

If stearic acid be treated for several days, by boiling nitric acid, it finally disappears, and a limpid, acid solution is obtained, which contains, besides suberic acid, a very large proportion of almost pure succinic acid.

Suberic Acid.—When the acid solution is evaporated to one-half, at the end of about 24 hours, it becomes an almost solid mass. It is purified from the supernatant liquor by washing with cold water, several crystallizations in hot water, pressing, and desiccation. Thus prepared, it is white and inodorous, and presents all the chemical properties of the acid, which is obtained from the stearic acid. Dried at 100° C., it does not enter into fusion below 120°C.

* *Annales de Chimie et de Physique*, Sept. 1841.

The calcination of the salt of silver gives :—

Oxide of silver	57·20
Acid	42·80
	100.00

The analysis of the same salt gives in hundredths :—

Carbon	26·05
Hydrogen	3·36
Oxygen	13·39
Oxide of silver	57·20
	100.00

Whence the formula

$$C^8 H^{12} O^3, Ag O.$$

The analysis of the free acid, dried and melted, leads to the formula—

$$C^8 H^{12} O^3, H^2 O,$$

whence it is evident that, in salts, one equivalent of water is replaced by one equivalent of metallic base.

Succinic Acid.—By evaporating the washing water of the suberic acid, I obtained a very white crystalline matter, which appeared to be a peculiar substance. Its atomic composition perfectly agrees with that of succinic acid.

In order to convince myself of the identity of the acid thus obtained, with natural succinic acid, I made comparative reactions, all of which fully confirmed my supposition. It is particularly in the washing waters of the suberic acid, as well as in the supernatant liquors of the product of the action of nitric acid, that succinic acid is found. It is obtained by slow evaporation: by cooling it deposits, accompanied by a large quantity of suberic acid, under the form of a white crust, and in large grains which adhere to the bottom of the vessel.

By means of several crystallizations in water, and by means of boiling ether which dissolves scarcely any succinic acid, and a large quantity of suberic acid, it may be freed from the latter. Crystallized in water, this acid is presented under the form of perfectly white grains, which, examined with a magnifying glass, exhibited tables collected in groups. Dried at 100° C., it enters into fusion between 170° and 175° C. (the natural acid melts at 178°); on cooling, it becomes a transparent and radiated mass; at a few degrees above its point of fusion, it sublimes in white needles of a silky lustre. It is by sublimation that succinic acid may be obtained in its greatest state of purity. Indeed, this acid is sublimed first, and condenses on the upper parts of the vessel, in the state of fine transparent tufts. By a new sublimation, it is obtained in a purer state than by any other process, and even amber does not yield it of so fine a quality. The solution of its ammoniacal salt does not cause any precipitate in the solution of chloride of barium, of calcium, and of sulphate of copper; it forms white precipitates in the neutral salts of lead, zinc, and silver.

The analyses of the free acid and of the salt of silver, lead to the formulæ—

$$C^4 H^4 O^3 + H^2 O,$$
$$C^4 H^4 O^3 + Ag O.$$

These results show, in the clearest manner, the identity of the artificial succinic acid with that which occurs in nature.

When the composition of succinic acid is compared with that of stearic acid, from which it is formed, or with that of suberic acid, which is produced at the same time as it, it seems that succinic acid is formed by the effect of the energetic oxidation to which suberic acid is subjected, under the influence of nitric acid.

Indeed, we have

$$\left.\begin{matrix} C^8 H^{12} O^3 \\ - H^4 + O^5 \end{matrix}\right\} = C^8 H^8 O^6 + H^4 O^2 = 2\,(C^4 H^4 O^3, H^2 O).$$

It may be obtained from both stearic acid and margaric acid, which is the first product of the reaction.

2 atoms of margaric acid	$C^{68} H^{132} O^6$
7 atoms of suberic acid	$C^{56} H^{94} O^{21}$
3 atoms of succinic acid	$C^{12} H^{12} O^9$
	$C^{68} H^{36} O^{30}$
	$- H^{36} O^{24}$

Nitric acid therefore furnishes 42 atoms of oxygen, 24 of which are employed in effecting the conversion of margaric acid into suberic and succinic acids, while the other 18 form water with 36 atoms of hydrogen. Thus succinic acid may be reckoned among the matters which the chemist can prepare artificially.

It is probable that amber itself is a product of the slow combustion or decay of some oil or vegetable fatty body. Perhaps mellitic acid, which much resembles succinic acid in its composition, and mellite, owe their formation to an analogous action. What speaks in favor of this fact is the latter being met with in coal mines.

ACTION OF NITRIC ACID ON OLEÏC ACID.

The action which nitric acid exerts on oleïc acid is analogous to that which the same agent has on stearic acid, except that it is more vivid and more energetic.

I have ascertained that the concentration of the acid does not modify the results, but the action is more or less slowly accomplished.

Oleïc acid is neither thickened nor resinified (*résinifié*) as M. Laurent sometimes observed. It becomes more and more fluid and colorless, gradually diminishing in volume, and, finally, entirely disappearing, if care be taken to renew the additions of nitric acid in a suitable manner.

The nitric acid that is distilled in this operation possesses a peculiar odor which does not disappear when the acid is neutralized by ammonia or carbonate of soda. By distilling the liquid neutralized with carbonate of soda, a light, limpid, and very fluid oil was ob-

tained, but the quantity was too small to be examined.

Margaric Acid.—If, after the first action of nitric acid, the operation is stopped, the oleïc acid sets, and gives, at the end of eighteen hours, a semi-solid, yellowish mass, traversed here and there by crystalline scales. Treated by boiling water, crystallised several times in alcohol, saponified and separated by an acid, this matter gives a white, brittle, crystalline acid, fusible exactly at 60° C. I analysed this substance: it had exactly the same composition as margaric acid.

The formation of margaric acid, in this reaction, still seems to me doubtful, for the quantity of the product obtained was very small, and the oleïc acid employed was not quite free from stearic acid.

In an experiment made with perfectly pure oleïc acid, I obtained neither margaric nor elaidic acid, but a solid white acid fusible at 80°C., which solidified at 70° C. With potassa this acid gave a red soap, and when the latter was decomposed by an acid, there separated only a small quantity of a thick, brown oil, liquid at the ordinary temperature.

By operating in the same manner, M. Laurent says he obtained elaïdic acid; however, he has pointed out neither the composition of the acid thus prepared, nor its point of fusion. The indication of these would have been so much the more important, as, according to M. Laurent, the composition of elaïdic acid differs only one atom of carbon, that is, 0·5 per cent. from that of margaric acid, as established by Varrentrapp.

Suberic Acid.—The nitric solution of oleïc acid contains, besides several acids found by M. Laurent, suberic acid, which may be isolated in the following manner:—

The product of the reaction of nitric acid on oleïc acid, when all action has ceased, becomes, at the end of twelve hours, and at 0°C. a crystalline mass, which is almost entirely composed of suberic acid, and of an oil soluble in alcohol, as well as of a small quantity of pimelic acid.

In order to remove the suberic acid, the whole is poured into a large funnel, the end of which is partially stopped with a glass rod. The supernatant liquor flows out, and may be entirely removed by washing in cold water.

After having crystallized it several times in boiling water, and after having pressed and dried it, suberic acid is obtained in a state of perfect whiteness.

This acid, thus purified, melts at 120°, and, on cooling, becomes a mass composed of very fine needles.

Heated in a flask it produced vapors which condensed in drops, which became crystalline by cooling: at the same time, it left a carbonaceous residue.

The ammoniacal salt did not precipitate the solutions of chloride of barium, strontium, and calcium, except when alcohol was added; it immediately occasioned white precipitates in the solutions of the neutral salts of silver, mercury, zinc, and tin. The suberate of ammonia likewise caused a blue precipitate in sulphate of copper, and a reddish brown one in sulphate of peroxide of iron.

I analysed the free suberic acid, as well as the suberates of soda, lead, and silver: this composition may be represented by means of the following formulæ:—

Hydrated suberic acid ..$C^8 H^{12} O^3, H^2 O$
Suberate of soda .....$C^8 H^{12} O^3, Na O$
Neutral suberate of lead...$C^8 H^{12} O^3, Pb O$
Basic suberate of lead....$C^8 H^{12} O^3, 3 Pb O$
Suberate of silver.....$C^8 H^{12} O^3, Ag O$
Suberate of oxide of ethule $C^8 H^{12} O^3, C^4 H^{10} O$

I prepared the suberate of oxide of ethule by passing a current of hydrochloric acid gas into a solution of suberic acid in alcohol. The ether separates during the operation. It is obtained perfectly pure by agitating it with water, and afterwards leaving it over chloride of calcium. It easily distils without being altered, and possesses the peculiar apple smell which is peculiar to the ethers of the fatty acids.

Pimelic Acid.—This acid is met with more particularly in the washing waters of the suberic acid, and in smaller quantity in the nitric mother-liquor, whence it is extracted by gentle evaporation. Crystallised several times in water, it occurs under the form of white grains, partly agglomerated, and essentially different from suberic acid. Dried at 100° C., it enters into fusion at 134° C., and readily sublimes in very beautiful silky tufts. It is rather more soluble in water than suberic acid. Its ammoniacal salt precipitates neither the solutions of the chlorides of calcium, strontium, or barium, nor that of sulphate of copper.

I submitted the free acid to analysis, as also the salt of silver. Their composition may be expressed by the following formulæ:—

Hydrated pimelic acid ....$C^7 H^{10} O^3, H^2 O$
Pimelate of silver .....$C^7 H^{10} O^3, Ag O$

These results perfectly agree with those of M. Laurent; I will only remark that his acid fused at 114° C., and that his ammoniacal salt precipitated the solution of sulphate of copper.

Adipic Acid.—This acid is obtained by the evaporation of the nitric mother waters. Crystallised in water, this acid occurs under the form of grains collected in groups. Dried at 100° C., it enters into fusion at 145° C., and sublimes as easily as pimelic acid. It is very soluble in water, alcohol, ether, and nitric acid. The solution of its ammoniacal salt does not precipitate the solutions of chloride of barium, calcium, sulphate of copper, or acetate of lead; it forms, on the contrary,

a white precipitate in the solution of nitrate of silver.

Submitted to analysis, this compound gave me numbers which lead to the formula

$$C^{14}\ H^{22}\ O^{9}.$$

The analyses of the salts of baryta and silver led me to look upon this compound as a bibasic acid. We have then

Free acid ..... $C^{14}\ H^{18}\ O^{7}+2\ H^{2}\ O$,
Adipate of baryta..... $C^{14}\ H^{18}\ O^{7}+2\ Ba\ O$,
Adipate of silver..... $C^{14}\ H^{18}\ O^{7}+2\ Ag\ O$.

The composition of this acid, as I have established it, varies considerably from that which M. Laurent has admitted: this difference is no doubt owing to that chemist having examined only the free acid and its salt of baryta, and to his not having burned the latter with the oxide of copper. My analysis of the free acid entirely agreeing with M. Laurent's, I consider myself so much the more warranted in regarding the new formula as correct.

Lipic Acid.—This acid is found in the brown and thick mother water which is obtained by decanting and pressing the pimelic acid. By the evaporation of this liquid, it is deposited, at the end of some time, under the form of transparent and very bulky lamellæ.

This acid, which I obtained only in very small quantity, was decomposed by the evaporation of the nitric solution, which prevented me from examining its composition.

Azoleïc Acid.—When oleïc, margaric, or stearic acid is treated, we obtain, among other products, a peculiar acid, whose formation was indicated by M. Laurent, and to which he gave the name of *azoleïc acid*.

The products which I have obtained, whether by means of pure or crude oleïc acid, or by means of stearic acid, having been submitted to analysis, gave me results which lead to the formula

$$C^{14}\ H^{28}\ O^{4}.$$

I etherified this acid by employing the method which I described for the formation of suberic ether. The composition of this ether may be represented by

$$C^{18}\ H^{36}\ O^{4} = C^{14}\ H^{26}\ O^{3},\ C^{4}\ H^{10}\ O.$$

M. Laurent thought he had obtained, in his investigations, œnanthic acid; however, I have ascertained, by a great number of experiments, that the body which he took for œnanthic ether was only a mixture of azoleïc ether and sulphuric ether, which possesses, it is true, the odor of œnanthic ether.

If we compare the composition of oleïc and stearic acids with that of the bodies which are produced by the oxidation of these acids under the influence of nitric acid, we remark that the production of the latter takes place by virtue of a direct oxidation analogous to the phenomena of decay or of slow combustion.

Indeed, we have from oleïc acid

2 atoms of oleic acid...	$C^{68}\ H^{156}\ O^{6}$
3 atoms of suberic acid.	$C^{24}\ H^{36}\ O^{9}$
3 atoms of pimelic acid.	$C^{21}\ H^{3}\ O^{9}$
3 atoms of lipic acid...	$C^{15}\ H^{18}\ O^{12}$
1 atom of adipic acid..	$C^{14}\ H^{18}\ O^{7}$
1 atom of azoleïc acid..	$C^{14}\ H^{26}\ O^{3}$
	$C^{68}\ H^{124}\ O^{40}$
—	$H^{28}\ O^{32}$

or indeed, from stearic acid

1 atom of stearic acid...	$C^{68}\ H^{182}\ O^{6}$
1 atom of suberic acid..	$C^{8}\ H^{12}\ O^{8}$
2 atoms of succinic acid..	$C^{8}\ H^{8}\ O^{6}$
2 atoms of pimelic acid	$C^{14}\ H^{20}\ O^{6}$
2 atoms of adipic acid..	$C^{28}\ H^{36}\ O^{14}$
2 atoms of lipic acid..	$C^{10}\ H^{12}\ O^{8}$
	$C^{68}\ H^{88}\ O^{37}$
	$-H^{44}+O^{32}$

In the case of oleïc acid, it is evident that 46 atoms of oxygen are absorbed; 14 unite with 28 of hydrogen to form water, while the 32 other atoms remain in combination with the products of the oxidation.

In the case of stearic acid, 21 atoms of oxygen form water with 42 atoms of hydrogen, while 32 enter into combination with the products of the oxidation.

This mode of representing the oxidation of fatty bodies cannot be strictly accurate, seeing that I have not been able to ascertain the quantity of the products obtained.

ACTION OF NITRIC ACID ON THE SICCATIVE OLEÏC ACID OF LINSEED OIL.

The reaction which is manifested in this case is more violent than with the oleïc acid of the unctuous oils. The mass thickens and becomes viscous like oil varnish; very soon after, it becomes fluid, and at the end of twenty-four hours, it fries into a semi-solid mass. By treating this mass with boiling water, and by dissolving it twice in hot alcohol, I obtained a small quantity of a white acid completely resembling margaric acid. After having been saponified and reprecipitated, it entered into fusion at 56° C.

The nitric solution contained a very considerable quantity of suberic acid, which, after two crystallisations in water, presented all the properties of that acid, and which, dried at 100° C., fused exactly at 119° C. The mother-liquor did not yield, as in the other fat acids, pimelic, adipic, acids, &c., but a great quantity of pure oxalic acid, which essentially distinguishes siccative oleïc acid from the other fatty acids.

INVESTIGATIONS CONCERNING THE PRODUCTS WHICH RESULT FROM THE ACTION OF NITRIC ACID ON CASTOR OIL.*

BY M. T. G. TILLY.

The action of nitric acid on the fat acids, has recently been made the subject of researches by MM. Laurent and Bromeis, and the interesting results obtained by them having attracted the attention of chemists, professor Liebig engaged me to examine in his laboratory the products which result from the oxidation of castor oil, which differs in so remarkable a degree from other fixed oils.

One part of this oil was mixed with twice its weight of nitric acid, and an equal bulk of water, and the retort which contained the mixture was submitted to a gentle heat. After a short time, the action became very violent, and gases were formed in such abundance, that all the matter contained in the retort escaped.

It should then be withdrawn from the fire, in order that the action may proceed gradually. If the retort be placed on the fire, a sandbath must be used, in order that the action may be less violent. This means of oxidation should be continued several days, more or less, according to the strength of the acid employed. When the nitrous vapours diminish, the retort must be withdrawn from the fire. There is then found in the receiver nitric acid, water, and a peculiar volatile acid oil which forms the subject of the following columns. By adding water to the fatty mass which remains in the retort, and by distilling the mixture, a fresh quantity of this acid oil is obtained.

It must then be separated from the acid on which it floats, mixed with the water and redistilled. This process should be repeated several times, after which, it must be dried by being spread over fused phosphoric acid: chloride of calcium cannot be used, on account of its solubility in the acid.

The acid which is procured by this method is quite colorless and transparent; it has an agreeable aromatic odor and a sweet, piquant taste. It is not very soluble in water, and communicates to that liquid its peculiar odor. It is soluble in nitric acid, alcohol, and ether. It begins to boil at 148° C., and a small quantity is distilled over; but if the temperature is maintained for some time, it turns black, is decomposed, and gives empyreumatic products; whence it is evident that it cannot be distilled alone. It burns with a clear flame, and does not solidify at —17. I have given to this compound the name of *œnanthylic acid*, for reasons which I shall give further on.

Burnt with oxide of copper, this compound gave the numbers which lead to the formula:

$$C^{14}\ H^{14}\ O^{4}.$$

Œnanthylic Ether.— This ether is obtained by dissolving the acid in absolute alcohol and by passing a current of hydrochloric acid gas through the solution. Carbonate of potassa must be added to the product of the reaction, in order to neutralise all the acid; it must then be distilled. The ether then passes into the receiver, and may be freed from the alcohol which it contains by agitating it with water. Finally, it must be distilled over chloride of calcium, in a current of carbonic acid gas, on account of the decomposition which it undergoes by means of the oxygen of the atmosphere, at its boiling temperature.

Œnanthylic ether, thus prepared, is a colorless liquid, lighter than water, leaving a peculiar, agreeable odor, differing but little from that of nitrobenzide. It has a sweetish and rather piquant taste which leaves a disagreeable sensation on the palate. It is soluble in alcohol and ether; it burns with a clear blue flame free from smoke. It solidifies under the influence of the cold produced by a mixture of snow and salt, and is then presented in the crystalline form.

Submitted to analysis, the compound gave the numbers which accord with the formula

$$C^{18}\ H^{18}\ O^{4}.$$

Let us now suppose that this ether is composed of 1 at. oxide of ethule, and of 1 at. anhydrous acid, we shall have for the composition of the latter,

$$C^{14}\ H^{13}\ O^{3};$$

and by adding to it 1 at. water to form the hydrate, we have

$$C^{14}\ H^{13}\ O^{3} + HO.$$

Œnanthylate of Potassa is obtained by neutralising the carbonate of this base with œnauthylic acid; it does not crystallise: by evaporation it assumes the form of a thick and transparent jelly.

The salt of copper crystallises in beautiful needles of a very rich green. It is soluble in alcohol, and not very soluble in water.

The œnanthylate of strontia is presented under the form of brilliant pearly scales, much resembling the salt of baryta.

It results then from the preceding analysis, that the composition of the anhydrous acid is

$$C^{14}\ H^{13}\ O^{3},$$

and that it enters into the following combinations:—

Œnanthylate
of water ..... $C^{14}\ H^{13}\ O^{3} + HO$;
of oxide of ethule $C^{14}\ H^{13}\ O^{3} + C^{4}\ H^{5}\ O$;
of baryta ..... $C^{14}\ H^{13}\ O^{3} + Ba\ O$;
of silver ..... $C^{14}\ H^{13}\ O^{3} + Ag\ O$.

It has been ascertained, of late years, that wine owes its peculiar odor to a certain acid in combination with oxide of ethule. MM. Pelouze and Liebig, who discovered this acid, gave it the name of œnanthic acid. This acid has the following composition:—

$$C^{14}\ H^{13}\ O^{2} + Ag.$$

* *Annales de Chimie et de Physique*, Troisiéme Série; Sept, 1841.

The analogy which exists between this acid and that which I have described is readily perceived: the composition of these two acids would lead us to suppose that they are oxides of the same radical, which would be represented by $C^{14}\ H^{13}$; whilst the two acids would be respectively representing the radical by R,

$$R + 2\,O,$$
$$R + 3\,O.$$

According to this hypothesis, I have given to the latter, the name of *œnanthylic acid*, and I propose for the acid discovered by Pelouze and Liebig, the name of *œnanthylous acid*, which perfectly accords with the numbers deduced from the analysis of the acid.

Œnanthylate of Silver.—This salt may easily be prepared by a neutral solution of the acid in ammonia, and nitrate of silver. It precipitates under the form of white pulverulent flocks.

0·7165 of this salt give, by calcination, 0·3265 of metallic silver, which represent 0·3509 of oxide of silver. This gives, per cent.—

Oxide of silver.....	48·89
Œnanthylic acid	51·11
	100·00

which leads to the number 1517 for the atomic weight of the anhydrous acid. Calculation gives 1532·33.

By burning, by means of oxide of copper, the salt dried *in vacuo*, over sulphuric acid, numbers are obtained which lead to the formula

$$C^{14}\ H^{13}\ O^3,\ Ag\ O.$$

Œnanthylate of Baryta.—This salt is obtained by boiling carbonate of baryta with an alcoholic solution of œnanthylic acid until the liquor no longer has an acid reaction.

The liquor should be filtered while it is warm: on cooling, this salt is deposited under the form of very brilliant pearly scales, which are insoluble in ether, but soluble in alcohol and water. This salt contains, per cent.—

Oxide of barium	38·23
Œnanthylic acid	61·77
	100·00

The formula which agrees best with this analysis is the following:—

$$C^{14}\ H^{13}\ O^3,\ Ba\ O.$$

It is not impossible that œnanthylic acid may be identical with the azoleïc acid of M. Laurent; but he did not obtain it in a very pure state.

When œnanthylate of silver is submitted to distillation, there passes into the receiver an oil and a solid body, neither of which possesses acid properties. The solid body is soluble in hot alcohol, and crystallises, on cooling, under the form of beautiful needles.

Suberic acid is another product of the oxidation of castor oil; it remains in the retort mixed with oxalic acid; it may be purified by repeated crystallisations, and by boiling with nitric acid.

Submitted to analysis, it gave numbers which lead to the formula—

$$C^8\ H^7\ O^4,\ \text{or}\ C^8\ H^6\ O^3 + HO.$$

The other acids found by M. Laurent do not appear to be formed in this reaction, but I could not affirm the fact in a positive manner. A small quantity of lipic acid may, however, be obtained by the evaporation of the supernatant liquors of the suberic acid.

INVESTIGATIONS CONCERNING SEBACIC ACID.*

BY J. REDTENBACHER.

When the product of the distillation of most fatty bodies is treated with boiling water, there is precipitated by the cooling of the liquor, white foliated crystals, to which M. Thenard, who first observed them, gave the name of *sebacic acid*.

To purify this acid, M. Thenard adds acetate of lead to its aqueous solution, and decomposes the precipitate, after well washing it, with hydrosulphuric acid.

Berzelius, who first examined this acid, boiled the products of the distillation of fatty bodies with carbonate of lime moistened with a large quantity of water, and separated the sebacic acid by decomposing the sebate of lime with nitric acid.

Many reactions induced Berzelius to believe that sebacic acid was nothing more than benzoïc acid modified in its properties by the presence of empyreumatic products. What led him to this conclusion, was the manner in which sebate of potassa acts with anhydrous alcohol. Indeed, that salt treated by alcohol, yielded another salt whose acid did not precipitate the salts of protoxide of mercury, nor those of silver; while the acid of the sebate not acted on by alcohol, and the acid of the portion not soluble in that vehicle, precipitated those solutions.

MM. Dumas and Péligot determined the composition of this acid by the analysis of its hydrate and of its salt of silver, employing for that purpose a sample which M. Lecanu prepared by the distillation of fatty bodies: their investigations led them to adopt for the hydrate, the formula

$$C^{10}\ H^{16}\ O^3 + H^2\ O,$$

the water being capable of being substituted by one equivalent of a metallic base.

I therefore undertook the following investigations, with the view of confirming this composition, and of ascertaining by virtue of what reaction this acid is produced by the distillation of fatty bodies.

I submitted to distillation olive oil and pork

* *Annales de Chimie et de Physique*: Sept. 1841.

fat, and I boiled the product obtained several times with water. On cooling, the latter assumed the form of a pap composed of very fine crystalline needles: the latter extracts always seem to contain a very considerable quantity of sebacic acid: however, its weight is very trifling.

The acid thus obtained was laid on a filter, washed with cold water, and then redissolved in boiling water in order to separate from it a small quantity of fatty matter which always adheres to it. This treatment is repeated until the product is perfectly white and deprived of all empyreumatic odor.

I also boiled the product of the distillation of fatty bodies with water to which I had added a certain quantity of ammonia, then I decomposed the ammoniacal salt thus formed by an acid. By this process, I did not obtain the sebacic acid in larger quantity, nor in a state of greater purity.

Thus prepared, this acid is presented under the form of needles or white, pearly folia, very light, and bearing a strong resemblance to benzoïc acid. It possesses an acid taste and slightly reddens turnsole, does not lose weight at 100° C., fuses at 270°, and sublimes at a higher temperature. Its vapor is irritant and has the odor which is peculiar to the vapor of all the fat acids. It possesses, moreover, all the properties which Berzelius, in his *Traité du Chimie*, assigns to it.

Submitted to analysis, it gave numbers which agree with the formula

$$C^{10}\ H^{18}\ O^{4}.$$

In order to determine its atomic weight, I prepared the salt of silver by precipitating a solution of sebate of ammonia by a solution of nitrate of silver. There was then formed a white, coagulated precipitate, scarcely soluble in water. The calcination of this salt and its combustion by means of oxide of copper have led me to the formula

$$C^{10}\ H^{16}\ O^{3}\ Ag\ O.$$

Whence it follows that the anhydrous acid should have the following composition:—

$$C^{10}\ H^{16}\ O^{3};$$

and that its hydrate should be represented by

$$C^{10}\ H^{16}\ O^{3} + H^{2}\ O;$$

which entirely confirms the composition that MM. Dumas and Peligot have assigned to this acid.

Sebacic acid forms with the alkalis very soluble salts, with the earths and metallic oxides, precipitates which are very little soluble, or quite insoluble, and which are more or less colored, according to the base they contain. I have examined only the salts of potassa and lime.

The sebate of potassa is obtained by neutralizing the carbonate of potassa with sebocic acid. It crystallizes from a concentrated solution in small crystals very soluble in water, not deliquescent, and very little soluble in absolute alcohol. This salt presents the following composition:—

$$C^{10}\ H^{16}\ O^{3},\ KO.$$

I have not succeeded in preparing an acid salt of potassa.

When the neutral salt is treated by an excess of sebacic acid, the latter separates without undergoing any alteration. I have not been able to extract from the neutral salt by anhydrous alcohol another salt whose acid precipitates neither the salt of mercury nor those of silver.

The sebate of soda resembles the salt of potassa; it is rather more soluble.

The sebate of ammonia is very soluble in water, crystallises irregularly, loses ammonia on being dried, and presents an acid reaction.

A not very concentrated solution of chloride of calcium, gives with sebate of ammonia a precipitate of sebate of lime, which is very soluble in water. Its dilute solution crystallises by spontaneous evaporation in the air in very fine shining bracteæ.

This salt presents the following composition:—

$$C^{10}\ H^{16}\ O^{3},\ Ca\ O.$$

In order to obtain a new means of determining the composition of this acid, I prepared sebacic ether, which was not known before. This compound is easily formed by passing a current of hydrochloric acid gas, to saturation, into an alcoholic solution of sebacic acid. The ether produced is washed with water, mixed with a little carbonate of soda, and is rectified after having been dried over chloride of calcium.

Submitted to analysis, this compound gave numbers which lead to the formula—

$$C^{14}\ H^{26}\ O^{4},$$

which may be decomposed into

$$C^{10}\ H^{16}\ O^{12},\ C^{14}\ H^{10}\ O.$$

After having thus confirmed the composition of sebacic acid and of some of its data, I may conclude with a few words on the mode of its formation. Most fatty bodies of animal or vegetable origin yield sebacic acid when distilled: thus, for instance, beef and pork fat, olive and sweet oils, &c. Stearic and margaric acids, when pure, do not give the least trace of this acid: it is the same with glycerine. Besides these three principles, fats and oils contain only oleïc acid; whence it is necessarily concluded that sebacic acid can only be the product of the distillation of oleïc acid.

When oleïc acid is distilled alone, the product contains, besides other substances, a great quantity of sebacic acid, of which the quantity does not increase, when the oleïc acid employed contains other fixed fat acids. Wax does not yield sebacic acid by distillation, therefore it does not contain oleïc acid. M. Thenard has already indicated the formation of sebacic acid by the distillation of wax, as a means of detecting whether it is adulterated with fatty matter. It is the same with spermaceti.

As sebacic acid is very little soluble in cold water, as it is easily detected, both by its appearance and by its reactions with the salts of lead, mercury, and silver, with which it forms a white precipitate; as it is sufficient to distil a few grammes of a fatty body, and as the extraction by boiling water is very rapidly operated, we are led to admit that sebacic acid is the best reagent for detecting the presence of oleïc acid in a fatty matter. This fact is of particular importance in the preparation of margarine and stearine, the only means which it has hitherto been possible to employ consisting in the saponification of the fatty matter, and the determination of the point of fusion of the fat acid liberated.

The best process which can be employed for the preparation of this acid consists then in submitting to distillation crude oleïc acid, a product of the manufacture of margarine candles.

NOTICE OF A TEST FOR NITRIC ACID IN THE SULPHURIC ACID EMPLOYED IN EXCITING VOLTAIC BATTERIES.*

BY MR. C. V. WALKER, HON. SEC. ELEC. SOC.

All who are in the habit of experimenting with voltaic arrangements, have witnessed the consumption of zinc by local action; and most experimentalists have found that the ordinary means of protection have not in all instances, been effectual in entirely arresting this destructive process; but very few have been aware that the cause of this is not existent in the zinc alone. Many have beheld with surprise the destruction of their plates, after every precaution has been taken to amalgamate them perfectly; and have been astonished that even the pure zinc thus treated is not even safe from the corrosive and profitless action. The unsuspected source of this evil must be sought elsewhere; and is fonnd to be in the impurity of the sulphuric acid of commerce. This acid most commonly contains a small quantity of nitric acid, the presence of which, though it be to a very inconsiderable amount, is highly prejudicial to the purpose for which it is employed. For the nitric acid will immediately attack the mercury, and thus expose portions of the zinc in an unprotected state. These unprotected portions in conjunction with the rest of the surface form elementary pairs, the elements being zinc and amalgamated zinc, and thus give rise to an amount of local action to no inconsiderable extent. These exposed spots form the positive metal in the elementary pair; and very frequently are eaten into holes, entirely through the plate. It is therefore most important to the experimentalist, that he should be on his guard against this, and be enabled to detect the enemy which would thus undermine and counteract his best designed operations. And to none is this more important, than to the electrotypist, whose batteries are in action, not by the hour or day only, but by the week or the month; and to him it is of especial moment when he employs a Smee's battery, or *the constant acid* battery, the whole energy of either depending upon the undisturbed affinity between the acid and the zinc. I am convinced that very often the metallic arrangements have been condemned, when the whole fault lay in the impurity of the acid.

These observations occur from a conversation I held in the laboratory of St. Thomas's Hospital with Dr. Leeson; and to him is due anything of interest or utility which may be gathered from the present notice. It is through his kindness I am enabled to furnish members with the following interesting test for nitric acid; the certainty and value of which he experimentally illustrated on the spot upon two specimens of acid.

Into two clear flasks were placed specimens of sulphuric acid, the one known to be free from nitric acid, and the other suspected to be impure. Some sulphate of indigo was dissolved in distilled water, in quantity sufficient to give it a deep blue tinge, and an equal measure of this solution was poured into each flask upon the acid. The two flasks, with their contents, were then submitted to the heat of spirit-lamps, and after a few minutes, the blue color disappeared from that containing nitric acid, while it remained unimpaired in the other. This test is so simple and effectual as to be available to every one; the operation can be done in a few minutes, and the white or straw-color acquired by the impure specimen, is an infallible test of the presence of nitric acid.

I then examined with Dr. Leeson, several zinc plates which had been used in his experiments, and was surprised at the difference in the condition of those excited with pure and those with impure acid; other things being the same, the former were uniformly acted upon; the latter presented the appearance, with which we are all familiar, of a corroded surface excessively eaten away at parts. Independently of the great loss of electric agency, when the metal is thus destroyed by local action, great waste of zinc must be taken into account. More is consumed in this way than by the ordinary battery action. Theoretically, for every ounce of zinc consumed, nearly an ounce of copper should be released in the decomposition of a salt of that metal; practically, this is far from being the case; the proportion of zinc destroyed to the copper deposited is widely different, it is more commonly two or threefold. On the score then of economy and order, it is advisable that among

* *Proc. Lond. Elec. Soc.*, Sept. 1841.

the precautions taken to ensure regularity of action, should always be included an examination into the purity of the acid. In fact, of so great importance is this, that pure acid supersedes the necessity of employing *pure* zinc; zinc in this condition is not obtained without some considerable consumption of time and labour; but with the acid free from nitric, it is not needed. Dr. Leeson assures me that the ordinary rolled zinc of commerce will do equally well. If this is well amalgamated, (using in the process the pure acid,) and is excited with the same, the action will continue, and there will be no need, as there often is under other circumstances, of re-amalgamation.

Kennington, 13th Sept. 1841.

INVESTIGATIONS CONCERNING THE SERIES OF SALICULE.*

BY M. C. GERHARDT.

It is known that M. Laurent found in coal gas a peculiar body, hydrate of phenyle, which forms the primitive type of picric or carbazotic acid, for its formula is $C^{24} H^{12} O^2$. It is also known that the latter acid is formed by the action of nitric acid on salicine, on hydroguret of salicule and saliculic acid. Now saliculic acid being $C^{28} H^{12} O^6$, or indeed, $C^{24} H^{12} O^2$, $C^4 O^4$, I ought to be able to extract hydrate of phenyle from it.

I was perfectly successful. It is only necessary to distil this acid rapidly after having mixed with it a little powdered glass, or better still, a little lime, and it is thus completely converted into carbonic acid and colorless hydrate of phenyle.

Hydrate of phenyle, thus obtained, crystallises at a low temperature, has the odor of creosote, and is distinguished by its extreme causticity. Concentrated nitric acid attacks it powerfully, and converts it into picric acid.

Saliculic acid yields this body with great readiness, and even when it is impure, it cannot be distilled without furnishing a considerable quantity of it.

Another fact which should attract the attention of chemists is, salicine is directly converted into saliculic acid under the influence of potassa in fusion, and without any necessity of first producing hydroguret of salicule by means of bichromate of potassa and sulphuric acid. Liquid potassa does not decompose salicine, but the latter is vividly attacked, with a disengagement of hydrogen, when it is added to potassa in fusion. There is then obtained, by the employment of an excess of potassa, perfectly white and pure saliculic acid, and by using an excess of salicine, hydroguret of salicule, as well as an acid resin, which appears to form the transitory body between hydroguret of salicule and saliculic acid.

This reaction will probably enlighten me concerning the constitution of salicine.

The formation of the type of hydrate of phenyle being well proved for this series of salicule, it remains for me to pursue the formation of this type or of its compounds in the series of indigo, a substance which, as is known, is likewise converted into picric acid under the influence of nitric acid. In this manner, I shall be enabled to connect these two series; every thing seems, besides, to show that indigotic acid is nothing more than nitro-saliculic acid, $C^{20} H^{11} (N^2 O^4) O^6$, and that Erdmann's chlorindoptic acid is probably identical with M. Laurent's chlorophenesic acid.

In a memoir which I shall soon have the honor of submitting to the Academy, I shall endeavour principally to demonstrate by experiment the intimate connexion which subsists between the series of salicule and that of indigo.

* *Comptes Rendus*, No. 14, Oct. 4, 1841.

INVESTIGATIONS CONCERNING BALSAM OF TOLU.†

BY M. DEVILLE.

Balsam of tolu contains an essence which may be separated by distillation with water. This very complex substance consists of:—

1st. A volatile oil, boiling at about 170° C., whose composition is represented by the formulæ $C^{48} H^{36}$:

2nd. Perfectly formed benzoïc acid, which is developed by time and exposure:

3rd. A substance which all its properties and its elementary composition show to be identical with the cinnamine which M. Frémy obtained by treating balsam of tolu with alcoholic potassa.

If balsam of tolu be distilled on the bare fire, taking all the precautions which this difficult operation requires on account of the continual swelling of the matters contained in the retort, four distinct compounds are obtained:—

1st. Benzoïc acid in considerable quantity:

2nd. In the alcoholic mother liquors of the crystallisation of this acid, a small quantity of cinnamic acid is found:

3rd. An oily substance, boiling at 108° C., whose composition and density of vapor lead to the formula $C^{28} H^{16}$, the same as that which MM. Pelletier and Walter have assigned to their retinaphtha. Retinaphtha and benzoïn should not be considered as isomeric, because their chemical properties are essentially different. Benzoïn gives with sulphuric

† *Société Philomatique de Paris;* Sitting of August 14, 1841: from *L'Institut*, No. 400.

acid an acid whose composition in salts is $C^{28}\,H^{14}\,S^2\,O^5$, and in the crystallised and free state, $C^{28}\,H^{14},\,S^2\,O^5 + H^6\,O^3$. Concentrated nitric acid produces, without the aid of heat, with benzoïn, a compound of $C^{28}\,H^{12}\,N^2\,O^4$, and with heat, after a prolonged action, a crystallised substance, $C^{28}\,H^{12}\,N^4\,O^8$. Chlorine acts very powerfully on benzoïn. This action is so intense that its first products disappear as they are formed, so that, to obtain them isolated, as they are liquid, it is not known at what time the operation should be stopped. However, M. Deville has obtained the most volatile, which consists of $C^{28}\,H^{14}$, Ch^2. The action of chlorine being prolonged, we obtain successively $C^{28}\,H^{10}\,Ch^6$, $Ch^2\,H^2$, then $C^{28}\,H^{10}\,Ch^6$, $Ch^4\,H^4$, and $C^{28}\,H^{10}\,Ch^6$, $Ch^6\,H^6$. The last is crystallised, and is identical in composition with M. Péligot's chloride of benzoïn. The last term of this series is $C^{28}\,H^4\,Ch^{12}$. It is crystallised.

4th. Balsam of tolu, when distilled, produces a substance which, by the action of acids, yields benzoïc acid, and under the influence of potassa gives benzoate of potassa and alcohol. On the other hand, it has all the physical properties and the composition of benzoïc ether.

M. Deville has observed that benzine, under the same circumstances which give rise with benzoïn to the compound $C^{28}\,H^{12}\,Ch^4\,O^8$, furnishes also a crystallised combination of great beauty, $C^{24}\,H^8\,Ch^4\,O^8$, which completes the analogy between these two substances.

PREPARATION OF SULPHOCYANURET OF POTASSIUM.*

BY M. A. MEILLET.

The preparation of sulphocyanuret of potassium by alcohol is very expensive, and limits the use of that valuable test for the salts of iron; I therefore endeavoured to procure it in another manner, and I have completely succeeded. The mixture of dried prussiate of potassa and sulphur is introduced into a Hessian crucible, and heated to the state of pasty fusion; the matter is stirred with an iron rod, and then immediately removed from the fire. When the crucible is cooled, the matter is pounded and washed with water instead of alcohol, filtered, and a liquor charged with sulphocyanuret of potassium and a little sulphocyanuret of iron is obtained. The iron is precipitated by means of carbonate of potassa, the liquor is decanted, and if it be alkaline, it may be saturated with a little acetic acid; it is evaporated, and crystallised several times; the acetate of potassa remains in the supernatant liquors.

The first recommendation—that of not heating the mixture beyond the state of pasty fusion, is based on practice: indeed, I remarked that when it was heated, as directed in books, to dull redness, a great quantity of the sulphocyanuret of potassium was decomposed, and a considerable quantity of carbonate of potassa was produced. Now, it is better to have in the liquors a sulphocyanuret of iron which is easily converted into sulphocyanuret of potassium, than carbonate of potassa, which constitutes an actual loss.

If the fire has been too strong, which is very commonly the case, in washing the matter with water, we have a mixture of sulphocyanuret of potassium and carbonate of potassa. Now, as the boiling alkaline solutions decompose the sulphocyanuret into sulphuret of potassium, carbon, which is deposited, and nitrogen, which appears under the form of bubbles, it was necessary to employ alcohol to isolate the carbonate insoluble in this vehicle. It is then requisite to employ a few drops of white pyroligneous acid to saturate the free alkali; it is then evaporated and crystallised. The last mother waters may be treated by acetate of lead: sulphocyanuret of lead is obtained, serving for the preparation of sulphohydrocyanic acid.

Sulphocyanuret of potassium, thus prepared, does not cost more than sixteen francs per kilogramme.

* *Journal de Pharmacie*, Oct. 1841.

BITUMINOUS SHALE.†

A new branch of industry seems likely to organize itself in Belgium. The different produce extracted from bituminous shale, by means of the works established about ten months since, on the banks of the canal, near Lacken, merits the attention of consumers, especially the extracts of oil and charcoal. This last production, of which extensive application has been already made in the sugar-refineries, and particularly in that of M. de Vandenberghe de Binkum, at Tirlemont, may acquire great importance at a moment when the depreciation of sugar cannot be balanced but by a diminution of price upon the original materials of manufacture. A reduction of 30 per cent. on the price of charcoal, fit for refining, would offer an important advantage, and it is to be hoped, that the experiment may prevail over the prejudices of those who, from habit, stop short on the road of improvement. The works of M. de Binkum are open to all manufacturers, who wish to assure themselves, by personal inspection, of the advantages that the employment of this kind of charcoal offers. The shale charcoal possesses, moreover, a disinfecting power, which acts instantaneously on all the animal matters, even the most fœtid, and transforms them into a powerful

† *Le Fanal.*

manure. These two applications of this preparation alone would suffice to assign an important place to this new branch of industry.

REVIEWS.

LECTURES ON CHEMISTRY; *Including its Applications in the Arts.* By Henry M. Noad, Lecturer on Chemistry. Part V. London: R. Hastings, Carey Street; and Scott, Webster, and Geary, Charter House Square.

In the present part, Mr. Noad gives the theory of volumes—the atomic theory, illustrating the doctrines by well chosen examples. He then proceeds to the consideration of the undecompounded non-metallic bodies, commencing with oxygen.

We have room for the following extract:—

"Oxygen gas is essential to animal life, and it is its presence in the atmospheric air which fits that compound for its uses in the economy of nature. The change which it produces in the blood of a living animal may be seen by agitating it with a portion of blood drawn from a vein, the dark color becomes a fine vermilion red, characteristic of arterial blood. Oxygen gas then is absolutely essential to arterialisation, though to maintain animal life it must be diluted.

"An animal can live longer in a vessel of pure oxygen than in the same volume of atmospheric air: nevertheless, its continued respiration in a state of purity is injurious, nay, fatal. A rabbit is found to breathe it without inconvenience for some time, but after an interval of an hour or more, the circulation and respiration are much quickened, and a state of great excitement of the general system supervenes; this is followed by debility, and death occurs in from six to ten hours; the blood is found to be highly florid in the veins, as well as in the arteries, and the heart continues to act strongly after the breathing has ceased.—*Broughton.* The animal lives as it were too fast, and death is occasioned by a general inflammatory fever."

THE LITERARY AND SCIENTIFIC REGISTER *for* 1842; *Combining in a Condensed Form a variety of Practical Information in Astronomy, Botany, Chemistry, Medicine, Meteorology, Zoology, and Science.* By J. W. G. Gutch, M.R.C.S.L., &c. &c. &c. London: Suttaby and Co., Stationers' Court.

This is one of the most useful little works that has lately come under our notice; it is replete with information of the most varied character, and will be hailed as a boon by those whose heads are so occupied with matters connected with their daily business as to render it almost impossible for them to recollect what is contained in this pocket-book. We must confess that our memory has at times failed us, and we have then felt that there was a kind of vacuum which this work will in great measure fill up.

To give an account of the articles this work contains, would take up more space than we can spare: we must therefore content ourselves with stating the principal heads under which they are arranged. The first which meets our view on opening the book is "Astronomy," which is followed by "Botany." The next subject is "Chemistry," under which head is given the atomic weights of the simple substances, and a few hints on Electrotype Manipulation: this is succeeded by "Meteorology," to which the editor has alloted a good share of space. Under this head is given a meteorological journal, which we think likely to induce persons to note down the various changes in the weather which they would not otherwise do. Next comes "Medicine," in which is given a table "showing in what proportions opium and certain preparations of antimony, arsenic, and mereury, are contained in some compound medicines," which is likely to prove useful, the compounds formed of these substances being so numerous, that persons are likely to commit errors. The next head is "Miscellanea," under which we observe several very useful articles. In fact, the book is so crammed with matter, that it is almost impossible to give the reader any idea of its contents: we therefore most cordially recommend it, and wish it that reception at the hands of the public of which the industry of the editor has rendered it so deserving: no one should be without it, and the purchaser of it will find it the most useful pocket-book he ever possessed.

In conclusion, we would tell our readers that this book contains all the common information usually contained in a pocket-book.

THE OILY ACIDS; *Forming the first Supplement to the seventh edition of Dr. Turner's Chemistry.* By Justus Liebig, M.D. Professor of Chemistry in the University of Giessen, and William Gregory, M.D., Professor of Chemistry, King's College, Aberdeen. London: Taylor and Walton, Upper Gower Street.

(Second Notice.)

In our last, being unable to devote sufficient time and space to this valuable addition to organic chemistry, we promised some further remarks in our present number, a promise which we are now about to fulfil.

We are told in the preface to this supplement, that "the recent mention of an easy and accurate method of determining the amount of nitrogen in organic compounds (not yet published) has given a new impetus to the progress of discovery in animal che-

mistry."[2] The absence of a process on which reliance could be placed, has long been a very great drawback to chemical sciences, and we hope that it will soon be published for the benefit of the scientific world.

Organic chemistry, under the auspices of many of our continental brethren, and several of our countrymen, has recently received numerous and valuable developments; but to none are we so deeply indebted as to Dr. Liebig.

We gave in our last number, Dr. Liebig's remarks on the action of metallic oxides on fixed oils and fats. We now give, as being intimately connected with the same subject, an extract which we should have given before, namely, the author's

"APPENDIX TO THE OILY ACIDS. NATURAL FIXED OILS AND FATS.

"The term fixed oil, or fat in general, signifies a compound of oxide of glycerule with certain organic acids. Such compounds are exclusively natural products, not having as yet been formed artificially.

"Among animals they occur chiefly in the cellular membrane; among plants in the seeds, capsules, or pulps surrounding the seeds; very seldom in the root. They all, when fluid or melted, make a greasy stain on paper, which is permanent, They are decomposed by acids, which combine with or destroy the oxide of glycerule; and by alkalies which unite with the acid, setting free the oxide of glycerule. The latter process is called saponification, because the compounds of the oily acids with alkalies have the properties of soap.

"The most abundant oils and fats are compounds of oxide of glycerule with stearic, margaric, and oleïc; two of these, and often all three, being present. Indeed, neither stearate, margarate, nor oleate of oxide of glycerule is yet known in a state of purity. From what has been said of these three compounds, which for brevity we shall call stearine, margarine, and oleïne, the consistence of the oil or fat depends on the predominance of one or other. Where the stearine predominates, the fat is firm and solid; if margarine be most abundant, it is soft like lard; while, if oleïne predominates, it is liquid. It is obvious that a mixture of stearine and oleïne in certain proportions will have the consistence of margarine.

"Fixed oils and fats are generally inodorous. Where they possess a peculiar smell, it is always owing to the presence of a compound of oxide of glycerule, with a volatile oily acid, such as butyric or hiric acid.

"Fats are more fusible than the acids they contain, but at low temperature they are harder. By pressure between warm plates, the greater part of the oleïne of fats may be separated. The remaining fat is harder, less fusible, and less greasy, in proportion as it approaches to pure stearine or margarine: in other cases they are definite compounds of stearine or margarine with oleïn; such is the case with the solid part of olive oil, and with the butter of theobroma cacao.

"Oils and fats may be divided into two well-marked classes, according to the action of atmospheric air, or of nitrous acid and nitrate of mercury, on them.

"The first of these classes contains the drying oils, so called, because, when exposed to the air, they absorb oxygen, and are converted into a transparent, tough, dry mass, or varnish. The drying oils, moreover, are not solidified by nitrous acid or nitrate of mercury.

"Of the nature and constitution of the drying oils, but little is known. They may be saponified by alkalies, but the acid of these soaps is different from the ordinary oleïc acid, and dries in the oils, like the oil from which it is obtained. They also contain oxide of glycerule. Many of the drying oils contain stearine or margarine, or both, dissolved.

"The second class, which may be called that of the fat oils, contains those oils and fats which do not dry on exposure to air, and which, when liquid at ordinary temperatures, or solidified by nitrous acid or nitrate of mercury.

"Owing to the impurities which oils and fats in their natural state coutain, such as membrane, mucus, or albumen, and which act like the yeast in promoting chemical action, most of them, when kept, become rancid, as it is called. This change is produced by the absorption of oxygen in part, while the oily acids are set free, and sometimes, as in palm oil, oxide of glycerule is liberated. The rancid smell is owing to the production, at the expence of the elements of the oxide of glycerule, the impurities and the oxygen of the air, of a volatile body which appears to be acid, as alkalies remove it. Pure stearine, margarine, and oleïne do not become rancid."

This supplement contains, among many other highly important subjects, a most interesting chapter on the essential oils. The author divides these oils into three classes:—Non-oxygenated essential oils, oxygenated essential oils, and essential oils containing sulphur. We extract his introductory observations:

"OF THE VOLATILE OR ESSENTIAL OILS.

"Many vegetable products, when distilled with water, yield essential or volatile oils, which are liquids, more or less volatile, sparingly soluble in water, generally colorless, although occasionally having a peculiar tint, and for the most part possessing the entire odor of the plant. They are inflammable, burn with a bright but smoky flame, and un-

dergo peculiar changes by the action of air and water.

"Analgous to these are the so called empyreumatic oils, which are among the products of the destructive distillation of organic matter.

"Many of the essential oils exist already formed, and in the free state, in certain parts of plants; as, for example, in the rind of the orange and lemon, from which they may be obtained by mere pressure. Others flow from mere incisions in the plant, combined with resin, forming what are called balsams, as is the case with oil of turpentine. In several cases it has been proved, that the oils are first formed by the mutual action of two or more organic compounds when the plant is placed in contact with water; this is the case with the oil of bitter almonds, and with oil of mustard, and is true of all the volatile odoriferous oily matters formed during fermentation or putrefaction.

"It thus happens that perfectly inodorous plants, as, for example, *centaurium minus*, when allowed to ferment with water, and then distilled, yield a penetrating essential oil.

"The essential oil of *spiræa ulmaria* may be obtained, with all its characteristic properties, from salicine, by the use of oxidising agents; and finally, when starch or sawdust and similar substances are heated with sulphuric acid, peroxide of manganese, and water, they yield, besides formic and carbonic acids, oily liquids possessing all the characters of essential oils.

"In some fragrant flowers, as the lime blossom, jonquil and jassmine, the odorous principle may be extracted by ether or by fixed oil, but cannot be obtained by distillation with water; either because it is decomposed; or else is so soluble that it cannot be separated readily from water. In the latter case, it may sometimes be separated by saturating the water with common salt.

"Many essential oils contain a crystalline substance dissolved, to which the name stearoptine is given. This in numerous cases, as in the oils of lavender and valerian, is pure camphor. Others contain volatile oily acid mixed with a neutral oil, as is the case in oil of cloves; and many contain nitrogenized compounds, such as ammonia and hydrocyanic acid.

"Their specific gravity varies; some are heavier, others are lighter than water.

"Some contain no oxygen; while in others that element is present. It is worthy of especial notice, that all the non-oxygenated essential oils as yet accurately analysed contain carbon and hydrogen in the same relative proportions, expressed by empirical formula C 10 H 8. With widely different properties, they yield the same result, as to these elements, in 100 parts. There can be no doubt that in many cases the true formula is a multiple or submultiple of the above. In others, the arrangements of the same number of equivalents may vary.

"The oxygenated essential oils are commonly mixtures of several differing in volatility; but, as no one has succeeded as yet in effecting their complete separation in any case, the analyses of them which have been made are of no value.

"All essential oils are miscible with alcohol; and they are more soluble in weak spirits, the more oxygen they contain. To water, although sparingly dissolved by that liquid, they give their peculiar odor, forming what are called *distilled waters*. When these are made by distilling the plant with water, they are apt to mould, from the presence of matter; but, if distilled a second time, they keep well in closed vessels.

"It must here be observed, that the odor of these oils is closely related to their alteration by air and water. They almost all absorb oxygen, and those which do so most rapidly, have the strongest smell. If non-oxygenated oils be distilled with quick lime *in vacuo*, or in an atmosphere of carbonic acid, the product is absolutely inodorous; and it is impossible in this state to discriminate oil of lemons from oil of turpentine or of juniper: but, when exposed to the air, they quickly become odorous, while they absorb oxygen, becoming viscid and resinous. It would appear, therefore, as if the odor accompanied the act of oxidation, as is the case with metallic arsenic. By long exposure to the air, these oils gradually acquire the aspect of resins. Many become acid which before were neutral: the acid in oil of cinnamon is cinnamic, in oil of bitter almonds it is benzoic acid; and, according to Bizio, in some cases it is acetic acid. It is probable that the resins formed by the oxidation of essential oils are identical with those which in the balsams accompany the oils; but on this point we have no experiments. According to Saussure, carbonic acid is one of the products of the action of the atmosphere on essential oils.

"It is not probable that these oils act as radicals, combining with oxygen directly to form the resins; it seems more likely, that the oxygen removes one portion of their hydrogen, while the remainder of the hydrogen resists the action of oxygen, chlorine, and iodine much more strongly.

"All the non-oxygenated oils, in contact with iodine, yield a part of their hydrogen with a kind of explosion, while iodine replaces the hydrogen thus removed. The new compound, although rich in hydrogen, does not yield any more to an additional quantity of iodine. The action of both oxygen and chlorine is analogous: both remove a part of the hydrogen; both, also, enter into the new

compound, replacing that element; so that the new body, the resin, for example, always contains less hydrogen than the oil.

"By strong nitric acid the essential oils are converted into resinous matters, as yet little studied. Many oils burst into flame when mixed with nitric acid, especially if a little sulphuric acid be previously added to it. When boiled with moderately strong nitric acid till dissolution ensues, the oils yield peculiar crystallizable acids, but no oxalic acid. The essential oils dissolve sulphur and phosphorus, and are miscible with bisulphuret of carbon and hydrated acetic acid.

"We shall now briefly describe the individual oils, and their relations to other substances. The whole subject is but imperfectly known; and a profound and searching investigation is required not only of their composition, but also and chiefly of the changes they undergo by the action of oxygen, chlorine, iodine, &c. before we can hope to acquire a knowledge of their true nature and constitution. Oil of turpentine and oil of lemons, for example, are both composed according to the empirical formula C 10 H 8. The latter may be C 10 H 7 + H: the former C 10 U 15 + H. It is obvious that the decision of these and similar questions cannot be expected from mere analyses of the oils, however accurate."

All the analyses detailed in this work have been performed with extraordinary care, and the most implicit confidence may be placed in their accuracy.

No work of the present day comes near this: it stands alone: whether as an elementary work for the beginner, or as a book of reference for the proficient in chemistry, it is at present unequalled. We will conclude this notice by expressing our sincere hope that this work will have the effect, for which it is eminently calculated, of illumining much that is dark in science, and that the remaining supplement will not be long forthcoming.

II. CHEMICAL MANUFACTURES.

ON THE REPRODUCTION OF CHROMIC ACID FROM THE OXIDE OF CHROMIUM; AND FORMATION OF CHROMATE OF LIME.

BY CHARLES WATT, JUN.

In manufactures where large quantities of chromic acid are used, it has long been a great desideratum, in consequence of its high price, to discover some process by which the oxide of chromium may be re-oxygenised, and converted into chromic acid.

It is well known, that if oxide of chromium is fused with caustic potassa or soda, this object may be accomplished: but this process has one very great objection, viz. its expence, especially when the oxide of chromium is held in solution by acids, as is generally the case.

Another method was introduced by Mr. C. Watt, sen., about two years ago, in which the re-oxygenation of the oxide of chromium was effected by means of peroxide of lead; but as the oxide of chromium is generally held in solution, by either muriatic or sulphuric acid, and sometimes by both, this was found not to answer, in consequence of the formation of a large quantity of sulphate and chloride of lead: moreover, expense was an objection to the extended employment of the process, although not to such an extent as in the former one.

At that time, being in the habit of using large quantities of bichromate of potassa for bleaching palm oil, in the factory of Messrs. Hawes, I began some experiments on the subject, which terminated in the discovery of a process which, for nearly two years, I have worked with perfect success, and which has exceeded my most sanguine expectations. The difficulty in the outset was much increased by the presence of a great preponderance of both sulphuric and muriatic acids in the solution of oxide of chromium, but I have been enabled, by a careful management of the process, almost, if not entirely, to obviate this.

The article used to re-oxygenise the oxide of chromium in this process is so very cheap, and so easily obtained, that nothing can for a moment be argued against it on this score—an argument which is generally made use of, and I must say with much truth, against nine new chemical processes out of ten.*

The process is conducted in the following manner:—

The green oxide in solution is put into a wooden tub holding about 10 cwt., and some well slaked lime is added until the acid is saturated; it is requisite to add the lime gradually to prevent any of the oxide of chromium being precipitated during this part of the

* The reason of this is obvious: persons who live by the discoveries they make, or fancy they make, are so led away by their imagined success, that they never trouble themselves with manufacturers' calculations: if they did, they would not find themselves, and the parties to whom they offer their processes, so often deceived.

operation. The saturation of the superabundant acid being thus accomplished, if the solution contain sulphuric acid, the liquor is to be allowed to settle for an hour, and is then turned over into another wooden vessel, and finally slaked lime is added until all the oxide of chrome is precipitated, which will be shewn by the solution becoming of a milky aspect, and which may be satisfactorily ascertained by taking out a small portion, and allowing it to settle for a few moments, when, if the oxide of chromium is entirely precipitated, the supernatant liquor will be found to have entirely lost its color. I should here state that in this process it is of the greatest importance that the solution should be kept thoroughly stirred during the operation.

The oxide of chromium being now entirely precipitated, it is to be allowed to stand for a day or two to settle; the water is then to be taken off the top, and two or three pails of fresh water added, and the mass well stirred, A hole should be made in the bottom of the tub, which should be filled up with tow, so as to allow the water to drain off without permitting the oxide of chromium to pass out.

This substance, which is a mixture of oxide of chromium and lime, is then to be dried, and placed, about two inches in thickness, upon a furnace, the construction of which I shall explain further on, and turned about every half hour until the process is completed, which is shown by the substance having assumed a bright yellow color instead of the greyish one it previously possessed. During the whole of this part of the operation, care will be required not to employ too great a heat, as the product of this operation, which is chromate of lime, is decomposed by heat, assuming a green color, and is thus rendered worthless.

The furnace which I have found to answer the purpose better than any other, is formed of a large flat wrought-iron plate, so set that the fire may play evenly on its under surface: it should be about six feet long, and three feet wide, and the fire-place about one foot long, and two feet wide. It will be as well to build a thin arch directly over where the fire plays, as if this is not done, the plate soon becomes burnt through in this part. The plate should be held down by a strong iron bar on each side, which will answer two purposes, viz., of preventing the plate from rising, which it would otherwise do in consequence of the heat, and of forming sides for preventing the mixture of oxide of chromium and lime from falling off. According to this arrangement, as the fire plays under the plate lengthways, the chimney will be at the opposite extremity to the fire door, and by bringing it back again, about two feet above the plate, may be made serviceable for drying the article previous to its being burnt, which will save much time and fuel.

The material is first to be placed on the chimney in a pan which should be made to fit it, and dried: this being done, it is to be removed to the lower plate, chopped up, and the process carried on as before described. It should not be turned oftener than is necessary, as, the powder being very light, much waste is sometimes thus occasioned.

This process gives rise to much speculation as to the source whence the oxygen is derived, by which the oxide of chromium is oxygenised. At first sight, it would appear most probable that the water contained in the hydrate of lime produced the effect by its decomposition; and this appears to be in some measure corroborated by the fact that dry lime and oxide of chrome have no action on each other: but on more mature consideration this does not appear to be the case; if it were so, a large quantity of hydrogen would be given off: and I have never been able to effect the oxygenation of the oxide of chromium when the air has been excluded: however, be this as it may, moisture and a free access of air are indispensably necessary; and although I have here mentioned these speculations, which naturally arise, they in no way affect the results, which are a perfect oxygenation of the oxide of chromium and formation of chromate of lime.

One thing certainly is strange in this process, *i. e.* the quantity of lime sufficient for the formation of chromate of lime falls down with the oxide of chromium during its precipitation, and, if the process is conducted with care, with but very slight preponderance: of course the product contains whatever impurities the lime originally contained.

Chromic acid may be obtained from the chromate of lime by sulphuric acid, and, if care be used, of much greater purity than from chromate of potassa or soda, in consequence of the insolubility of the sulphate of lime which is formed.

It will be as well to state (and this should be particularly observed when the oxide of chromium results from the use of chromic acid in bleaching palm-oil) that the presence of organic impurities must be carefully avoided, or the results will be far from satisfactory: my reason for alluding to palm-oil more particularly is because during the process some glycerine is generated, which, if not well washed from the oxide of chromium before it is burnt, will, as I before stated, render the operation unsatisfactory. Since the discovery of this process, I have tried to apply it to the formation of chromic acid from the chrome ore, but at present my endeavours have not been attended with success, which I consider to be owing to the lime being incapable of fluxing the ore.

In conclusion, I would add that if the above process be carefully conducted, it will be found perfectly satisfactory, and, if the heat of the furnace, which should not exceed a dull red, is equally maintained, it will burn three

batches a-day, and will require only a very moderate supply of fuel.

Knowing, as I do, that large quantities of chromic acid are used, and that the consumption is greatly on the increase, I hope that this process may prove worthy of the notice of parties who are in the habit of using that article.

MANUFACTURE AND REFINING OF BORAX.*

BY M. PAYEN.

Formerly, crude borax, produced by the evaporation of little saline lakes, was procured for use in the arts from India, China, Persia, the Island of Ceylon, Southern Tartary, Saxony, and Peru; sometimes, imperfectly purified in those places and sent out in small crystals, it came to Europe under the name of half refined borax.

The process of refining, long kept secret in Venice, afterwards confined to Holland, was imported into Paris by the MM. Lecuyer; it presented difficulties which were not well understood and overcome until lately. Until 1815, refined borax sold at from 7 to 8 francs the kilogramme: at that time the manufacture by means of the boracic acid of Tuscany and factitious soda, was commenced in France.† At the commencement of the refining of this borax, the small volume and the little solidity of the crystals formed a serious obstacle to its sale, gave rise to a belief in the influence of particular bodies on crystallisation, and caused such a prejudice in favour of Dutch borax, that it was necessary not only to imitate the brownish tint and the Dutch packages, but to bruise the angles of the crystals, in order to produce an appearance similar to that of the foreign salt. The latter could not sustain the competition, which very soon lowered it 0·50.

Then M. Cartier and I were enabled regularly to prepare borax in large solid crystals, in well determined conditions, and in apparatus which I shall describe, adding the most recently introduced improvements, in concert with M. Buran. I will also point out the long unknown cause of the remarkable variations of the rendering into borax for equal quantities of boracic acid and soda employed, either in manufactories or in the laboratory.

First Matters.—We have seen how the boracic acid of Tuscany gradually became more impure: the products imported into France now contain only from 0·74 to 0·83 of crystallised acid; the larger quantities of foreign matters seem to be owing to the fact that the acid of Monto-Rotondo, which is less impure, is kept in the country for the manufacture of borax at Livourne.

The 17 to 26 hundredths of foreign substances comprise, in the acids at present imported, water, sulphates of ammonia, magnesia, lime, and alumina; chloride of iron, muriate of ammonia, traces of hydrosulphuric acid, argil, sand, sulphur, a yellow coloring matter, and a nitrogenous organic substance soluble in alcohol: the sulphates and chlorides contained in boracic acid are the cause of great expense in soda to manufacturers; there results from them sulphate of soda and carbonates of magnesia and lime. The traces of alumina and oxide and iron form with the other insoluble substances a bulky deposit which cannot be completely removed, with economy, from the solution.

The cost in carbonate of soda, and the loss of soda in the deposits, the foreign salts and supernatant liquors, depreciate so much the more the boracic acid already overburdened with expense for the carriage of these foreign bodies.

To the means which we have pointed out of avoiding these inconveniences, by purifying it at the places where it is produced, we may add that desiccation at 100° C., removing half of the water contained in the humid acid, would raise from 0·56 to 0·72, the proportion of real acid sent out, and would diminish in the same ratio all the expenses of importation. By adding the ecouomies pointed out in these simple improvements, the quantity of realisable acid sent out would be doubled under the same weight, or the expense of packing, carriage, insurance, duties, warehouse-room, &c., which amount to about 15 francs per 100 kilogrammes before it arrives in Paris.

For most of the purposes for which boracic acid is used, it is necessary to form it into borax; the formation and crystallisation of this salt present, besides, the most certain and economical means of eliminating foreign bodies. Finally, the form and characters of the crystals give to consumers every desirable guarantee.

PREPARATION OF CRUDE BORAX.

For treating 1000 kilogrammes of boracic acid, 1200 kilogrammes of crystallised carbonate of soda are employed, or an equivalent quantity of the dry carbonate or salt of soda of commerce, and about 2000 kilogrammes of water, minus the quantity which may be furnished by the supernatant liquors of a previous operation, or by the condensation of the steam used for heating it.

The carbonate of soda is first dissolved in a vat, lined with lead, and heated by means of steam from a boiler, and which may be introduced at will by turning a cock, into a pipe reaching almost to the bottom of the vat, where it joins a horizontal coiled pipe perforated with holes.

* *Annales de Chimie et de Physique*; July, 1841.

† See *The Chemist*, No. II., for an able paper, by Dr. Bowring, on the boracic acid lagoons of Tuscany.

When the carbonate is dissolved, and the temperature is raised to nearly 100° C., we begin to throw in, by 4 or 5 kilogrammes at a time, the powdered boracic acid. The arrangement of the covered vat allows the gases to be directed into a condenser, containing sulphuric acid, which might be useful to collect the ammonia disengaged in the state of carbonate, if the acid of Tuscany should continue to be imported as impure as it is at present.

At all events, it is useful to keep the vat covered, in order to prevent a great loss of heat; the acid should be added gradually, in order to prevent too great an effervescence at first, which would cause the liquid to run over: when all the acid is poured in, the solution should mark about 21° of Baumé's barometer, and the temperature should be raised to boiling, that is, about 105° C.

The steam is then stopped; the opening by which the carbonate and the acid were introduced is closed; it is then left to settle for 10 or 12 hours.

The liquid being sufficiently clear, it is drawn off, by means of a tap, into wooden crystallising vessels, lined with thick lead, whose depth does not exceed 50 centimetres.

When the crystallisation is finished, the supernatant liquors are drawn off into reservoirs.

The crystals, which are agglomerated in plates round the sides, are then detached by means of chisels and hammers; the crystalline plates are set to drain on an inclined plane, covered with lead, whose slope directs the supernatant liquors into a basin or gutter.

The supernatant liquors and the washings of the deposits of one operation serve to commence another saturation;* the crystalline plates constitute the crude borax, which requires refining.

The deposits formed in the vat are, after the decanting of the liquid, extracted by means of a large tap; they go into a reservoir, from which they are taken to be washed.

REFINING OF BORAX.

We have said that the principal difficulty of this operation was owing to the necessity of obtaining large and solid crystals: the volume depends on the mass of the solution, on the slowness, and especially on the regularity of the cooling; solidity can be obtained only by preventing the crystals from starting up by the action of the cold air, when the supernatant liquor is drawn off. These conditions are effected in the following manner:—

The solution is prepared in a vat, lined with lead, large enough to contain 9000 kilogr. of borax; the solution is effected with the aid of heat, by means of steam brought from the generator to the bottom of the vat by a leaden pipe.

The crude borax, and the small crystals of the preceding refinings are placed in an iron basket, suspended by means of a chain passing through a pulley: care is taken to immerge the basket a little below the level of the liquid, and as the liquid tends to precipitate by becoming more dense, currents are established, which facilitate and regulate solution, and avoid the troublesome operation of stirring the liquid.

To each metrical quintal of borax, about 8 kilogrammes of crystallised carbonate of soda are added, and the solution is brought to the density of 21° Baumé; the whole of the liquid is then run out into a wooden crystalliser, lined with thick lead, and covered with a lid likewise lined with lead.

These large crystallisers should be kept apart from one another, in order to prevent the blows necessary for removing the crystals from communicating a shock which would disturb the crystallisation. Some precautions should be adopted for rendering more gradual the lowering of the temperature. It is with this view that the sides are covered with a double envelope of joined plates, and that the space between the crystalliser and this double envelope, is filled with powdered charcoal, and, finally, that the upper part of the lid is covered with two or three layers of coarse woollen stuff.

The crystallisation is finished in twenty-five or thirty hours, according to the external temperature. It has been ascertained that it arrives at its last term when the thermometer does not mark more than from 25° to 30°. All the supernatant liquor is then run off, by means of a large syphon, the liquid retained at the bottom among the crystals is removed by means of a sponge; the lid is then let down, and the crystalline mass is left for five or ten hours, until it acquires an equilibrium of temperature with the surrounding bodies.

Then two men go into the crystalliser, and detach successively from top to bottom, with a hammer and chisel, the crystals at the sides: the whitest are found at the upper part, on all the vertical sides. Towards the bottom they are more voluminous, turbid and greyish: this tint does not displease consumers; however, the crystals at the bottom are set aside, in order to cleanse them from one another, and by screening them in a settled supernatant liquor.

All the crystals should likewise be separated by means of a small hatchet, on the table where the picking is carried on; they are afterwards turned into a basket, which eliminates all the small crystals, and which are redissolved and crystallised.

The picked crystals are packed in cases re-

* When the supernatant liquors contain too much sulphate of soda, chloride of sodium, organic matter, &c., they are evaporated to dryness after the borax has been allowed to crystallise at 33° C. then the sulphate of soda below crystallises that temperature.

sembling the Dutch ones, containing 60 kilog. nett.

The preparation of refined borax under the octohedral forms differs in the solution being charged until it marks 30° of Baumé's areometer for the temperature of 100° C; it then is put into the crystalliser: the octohedral borate commences to be formed when the temperature lowers to 79° C; it terminates at 56° C. It is then necessary to remove the supernatant liquor by means of a syphon, in order to avoid the prismatic borate being superposed on the former.

The operation is finished as in the former case, but the crystals remain bound together, since, far from being separated by the last shock, they remain combined in sonorous and very hard plates; it is therefore easy to obtain pieces of all dimensions. It is known that this borate differs from the first, because it contains five equivalents of water instead of ten, because it effloresces in damp air, and because its specific gravity is equal to 1·815 instead of 1·705.

The supernatant liquor, drawn from large vessels, allows to deposit an abundant crystallisation of prismatic borax, which, drained and dried, is applicable to all the purposes to which that salt is generally applied in solution or powder: however, its crystalline form not being so easily discernible as to present habitual guarantees in this branch of commerce, it is sent out so only to large consumers, and especially to the manufacturers of the fine china called opaque porcelain.

Octohedral borax is sold in plates whose faces do not present any appearance of facets nor of angles belonging to regular crystals; that is owing to an old prejudice of consumers, who designate octohedral borax by the name of fused borax, and think that they receive ordinary prismatic borax, when plates presenting on the face crystalline irregularities are sent to them. It is therefore customary to break with the hatchet all those edges, which, however, present the real criterion of the purity of this product.

It is conceived that the formation of a borate, containing 0·70 of dry salt instead of 0·47 which ordinary borax contains, must have occasioned mistakes relative to the renderings of the acid in manufacture on a large scale, and even in laboratory trials, when the circumstances and the nature of the formation of these two crystallisations were unknown.

PURIFICATION OF GUM SANDARACK AND MASTIC, FOR THE PURPOSE OF PREPARING COLORLESS SPIRIT-VARNISH.

BY T. W. NAYLOR.

Put two parts of gum sandarack, and one of mastic, into a suitable vessel: pour on them about four parts of spirit of wine; let them remain together for a few minutes, when, if on taking a piece of the gum out, it appears clear, transparent, and free from color, the liquid portion should be decanted off,* and the residual gums mixed with a sufficient quantity of alcohol, which must not, on any account, be weaker than 60°.

The varnish is greatly improved by the addition of about an ounce of Canada balsam to a pint of varnish.

Newcastle, Nov. 12, 1841.

* This liquid may be afterwards used in the formation of compound shell-lac and other varnishes, where a slight tinge of color is not an object of importance.—T. W. N.

III. PHARMACY, &c.

INUTILITY OF THE PHARMACEUTICAL SOCIETY TO COUNTRY DRUGGISTS.

To the Editors of the Chemist.

Gentlemen:—

When I wrote the observations which you have done me the honor to insert in your October Number, I did not expect that they would escape the notice of some members of the Pharmaceutical Society; indeed, had they done so, one of my chief objects would not have been answered, viz. that of learning from some of those who have the best means of knowing, what is the present state of that Society, and what are the objects to which it is giving its first and chief attention.

In the remarks which have fallen from the hand of your correspondent M. P. S. (I will drop the G. B., if you please, for sake of brevity and convenience, and not, I assure you, from any want of respect for those worthy initials), I am directed to "retrospect the actions of the society:"—I should be very happy to comply if I were in a position to do so; but unfortunately few of those actions have come to my knowledge; what I do know, is, that on the 15th of April last, at the second meeting of the members of the drug trade, held at the Crown and Anchor Tavern, the Pharmaceutical Society was constituted, and the committee formed. On the 1st of June a code of bye-laws was adopted, and from that time we may suppose the Society in working order. In July the Council published an ad-

dress to the Chemists and Druggists of Great Britain; and here I must end my retrospect, for I am not aware of any thing further that has been done.

In July the first number of the Pharmaceutical Transactions appeared—"instituted as an *experiment* for the purpose of illustrating the advantage of scientific discussion, and in the hope that similar meetings will shortly be appointed by the Pharmaceutical Society."—These meetings are private, and form no part of the Pharmaceutical Society, towards which M. P. S. has paid his subscription, and I believe it has never been announced to the subscribers where or when they are held.

Having complied with M. P. S.'s command, that I would retrospect the actions of the Society, I will go back to an observation of his. He says that the whole tenor of my letter is an attempt to prove that the present rate of subscriptions is too great, and that its objects are too extended. This is rather an extraordinary interpretation to put on my sentiments, and one which I reject. I do not think it just that a member living at a distance which precludes the possibility of his taking part in, or being present at the scientific discussions (that is, if the Society intend to adopt them) should have any part of his subscription expended upon them; such meetings should be supported by those who can avail themselves of their benefits. M. P. S. seems to think that we of the country can afford to provide more extensive opportunities of acquiring knowledge for our metropolitan brethren, without fear of suffering when placed in comparison with them, because they have not time to use the numerous advantages already at their disposal. He has quite settled the point, that the country druggists are the best chemists, to which of course I, as a country druggist, cannot object; and he says, perhaps the cause of this was unknown to me—I must confess it was. I have been engaged in both London and country business, yet I had not arrived at a knowledge of this fact before; and I must observe, that were I the proprietor of one of these hard-run London businesses he writes of, I would employ a sufficient number of assistants to have my business done with some regard to the comfort and mental cultivation of those about me.

I do not object that the sum of two guineas, or more, per annum, for the formation of a permanent school of chemistry and pharmacy is too much, but I do object to membership being purchased by yearly subscriptions. A designing person may pay his subscription for the first or second year, possess himself of the document shewing that he is qualified to write M. P. S. G. B. after his name, and for ever afterwards withhold his support.

I object that a Society cannot with propriety be termed "of Great Britain," unless all parts of Great Britain can equally share in its advantages, and I think it is not possible for those members whose business is at a distance from London, to join the conversational meetings, or make use of the library or laboratory.

M. P. S. tells me that "Fules and bairns should na see half dune wark." It is a matter of indifference to me in which of these two characters my brother druggist has been pleased to view the individual, whose puny efforts he considers to be aimed at the overthrow of the Institution. There was not much fear of my seeing "half dune wark," at the time in which I wrote my last, for as far as the country druggist is interested, it was not then begun, and although a second year's subscription is quickly becoming due, the only thing we have to rest upon is an announcement on the part of the Society, that "the council are endeavouring to meet with a house in a central part of the metropolis, with suitable accommodation, for the scientific and other business of the Society."

I am accused of treating with contempt the power of writing M. P. S. G. B. after the name of members. Now I am just anxious to keep it from contempt: M. P. S. says that members are admitted into the Society of Arts, the Botanical Society, and the Geological Society, by paying a sum of money. The truth is, that a person desirous of joining those societies must be proposed by a member; notice of his name, address, &c., must be hung up in the societies' rooms for a certain time; after which he is balloted for, and excluded if a certain number of black balls appear. Therefore we view the initials F.S.A., F.G.S., &c. more as a guarantee of the respectability of the member, and of his standing in society, than of the extent of his learning.

We are told by M. P. S. that we do not as yet know how many good branches may be given off from this parent stem: true; but at present we have only the seed. I wish to see it sown, germinate, become a perfect plant, firmly fixed, dispensing its benefits equally to those near, and those remote; and I do not think it would then lack willing hands to water it continually with the *Precious Element* sufficient to maintain it in full vigour.

I am, Gentlemen,
Respectfully, yours,
A Country Druggist.

REMARKS ON THE PHARMACEUTICAL SOCIETY.

To the Editors of The Chemist.

Gentlemen:—

Although some of the objections I feel to the constitution of the Pharmaceutical Society have been urged in your columns, yet I think it desirable that as many independent testimonies should be given as possible, in order that the Council may know the extent of that

widely spread feeling against which they combat.

It ought to be particularly understood, that it is the constitution of the Society that is objected to, and not its general objects. Every one must admit the importance of securing to the members of our trade an increased amount of intelligence and scientific attainments: but, whilst he desires this result, he may question the fitness of the peculiar measures proposed for the purpose. These two things are not quite so incompatible as some of your acute and learned correspondents seem to suppose.

The Pharmaceutical Society, in my opinion, can never seek to restrain any person from selling drugs who does not possess its diploma. Supposing it to be incorporated by royal charter, and to receive the support of the great body of the druggists throughout the country, any application for legislative powers to restrain such persons would recognise the justice of the claims made by medical men for protection against druggists, and, if carried out, would justify an act curtailing the privileges we already possess. Even if this were not the case, every druggist would be, as far as lay in his power, an occasion of rendering such a law ineffective, by endeavouring to sell every country shopkeeper drugs, &c., and from which he would derive a small profit.

Its benefits no doubt will be confined to an increase of public confidence in the trade, promoting the competency and scientific attainments of its members. But the question to be determined is, whether, upon the present constitution of the Society, it can become *generally* effective for this purpose.

No one at all observant of public opinion, can for a moment doubt that any honorary degree will be despised, unless accompanied by those attainments which fairly entitle its possessor to the distinction. Prejudice also is strongly excited against purchased distinctions, and this must operate against the first members of the Society. And without some alteration and extension of its privileges, this must continue to be the case with country members. To them, who most need, no advantages are offered. They are told that they must come to London to study. Are the projectors of the Pharmaceutical Society unaware that vast numbers of the young men who commence as druggists, never go to London at all; and, that of those who do go to London, few would be able to afford to devote their time and money, walking a Druggists' college. The only practicable improvement seems to have been despised by the council of the new Society. Had they made it a stipulation on the part of the Society that country members, where more than three lived in the same town, should hold periodical meetings, and send at certain periods papers of scientific or general interest to the Parent Society, they would have necessitated them to attempt self-improvement. These meetings in most towns would have given rise to the establishment of museums for their apprentices, and in many cases, lectures for the benefit of pupils would be given. Instead of this plan, they have chosen to ask for a subscription of 2*l.* 2*s.* per annum. The advantage they offer is, to send to the subscriber a monthly record of the great privileges enjoyed by his metropolitan brethren, and then leave him to furnish all the advantages he requires for self-improvement in addition. True, if the council of the new Society can secure their object, the benefit they will confer in making country druggists so benevolent as to prefer the improvement of others to their own, cannot be over-estimated.

The terms of subscription are much too high. Does the Pharmaceutical Society want 40,000*l.* a-year, to render it effective? Do its directors wish to render it general in its adoption? If they do, they ask for a subscription exceeding beyond all comparison that of any other medical body. But we wish to qualify for degrees, &c. Then let the recipients of the benefits pay for their advantages, as do those of all other incorporated bodies. They have now 600 or 700 in the kingdom enrolled as members, and are about to commence their undertakings. If 14,000*l.* or 15,000*l.* per annum is enough, why did they not fix the amount of their subscription at 5*s.* and have had twenty times the number of applicants for admission? In this way they would have been successful, and I will venture to predict that in their present plan they will fail;—that is, that the great body of the trade will not join except on equal terms.

I am, Gentlemen,

Respectfully yours,

John Shaw.

Derby, Nov. 9, 1841.

A FEW REMARKS ON THE PHARMACEUTICAL SOCIETY.

To the Editors of the Chemist.

Gentlemen:—

I have been aware of the existence of the Pharmaceutical Society for some time, but it was not until lately that I met with a small pamphlet on the subject, the perusal of the observations in which, fully stating the nature of that Society, and the objects it has in view, gained my concurrence, and hearty wishes for its success, with the exception of one point, and that is, as regards the subscription. Now it must be evident to every one, I think, that the London member will enjoy many advantages over the country one—such, for instance, as the mixing with the most enlightened of its members; hearing the various lectures contemplated; witnessing the practical working of the laboratory of the society; and being

always on the spot for acquiring early information connected therewith. These, I contend, are sufficient to excuse the country member from paying so high a subscription, because he cannot participate in the above privileges.

Taking these points into consideration, and considering also that the great bulk of the trade reside in the country, and that the demand is not merely to defray the expenses of forming the society, but that two guineas are to be subscribed annually, I am of opinion that the council would mete out justice to us, and get ample funds for all the purposes of the Society, were the subscription to be reduced to one guinea for the country members, and two for the town members.

Allow me to add in conclusion that I have, and probably so have other country druggists, been entirely overlooked by the council, not having had a circular sent me, or any communication whatever from them ; yet I am resident only 10 miles from town ; Pigott's Directory would therefore have supplied the name. If we are not worth soliciting, we are equally independent about the matter.

I am, Gentlemen,
Yours, respectfully,
A Country Druggist of 16 Years standing.

Nov. 15, 1841.

HINTS TO PRESCRIBERS OF SULPHATE OF QUININA.*

BY M. DONOVAN, ESQ.

The agreeable taste, odoriferous smell, and elegant colour of the acid infusion of roses have rendered it a favourable vehicle for the exhibition of more active medicines ; and the choice is the more fortunate when the medicinal or physical properties of the infusion assist those of the remedy for which it is the selected medium. On these accounts the infusion of roses is frequently employed as a solvent for sulphate of quinina. The latter being nearly insoluble in water, and while in the insoluble state being much less active, it is rarely prescribed in liquids merely aqueous ; sulphuric acid is therefore always employed to acidulate the water, as well as to add to the tonic powers of the salt. Infusion of roses contains the necessary quantity of sulphuric acid, and if it possess any medical efficacy, this coincides with the powers of the sulphate of quinina. Hence it is a common practice to prescribe infusion of roses with sulphate of quinina ; and it is supposed that the two medicines form an elegant, efficacious, and compatible mixture.

I believe that the supposition is ill-founded. The mixture is not elegant; for it is no longer red and transparent, but becomes muddy and disagreeable in appearance ;—it is not efficacious ; for much of the quinina is withdrawn in an insoluble state ;—and it is not compatible ; for there are two sources of decomposition. Rose-leaves contain both gallic and tannic acids ; hence gallate and tannate of quinina will be formed ; both are insoluble in cold water ; and they will remain floating through the liquid, notwithstanding the presence of sulphuric acid, which, so far as these salts are concerned, effects no good purpose, as it does not dissolve the new salts formed.

Sulphate of quinina is also prescribed in conjunction with compound infusion of orange-peel as a vehicle and adjuvant. I have seen this much practised both in England and Ireland, but believe the formula to be liable to the same objection, for a precipitate is copiously deposited.

It might be supposed that it is little matter in what state the quinina is administered, whether as sulphate, gallate, or tannate ; but if the sulphate require the addition of sulphuric acid to hold it in solution, and if the state of solution be necessary to the exertion of its full medical efficacy, it must be improper to conjoin with it any agent which eliminates it in the solid form. Besides, it has never been proved that either the gallate or tannate of quinina possesses medical powers.

It seems much better to prescribe the sulphate of quinina simply dissolved in water, or in camphorated mixture, by the aid of a little sulphuric acid. If adjuvants are required, they may be administered by themselves, some time after the exhibition of the sulphate. It is unsafe to combine or modify such delicate articles, as it is difficult to foresee where injury may be done. Who, except one that had witnessed the effect, would suppose that there could be any impropriety of conjoining sulphate of quinina with preparations of cinchona bark ? yet alcoholic solution of sulphate of quinina is copiously precipitated by tincture of bark, and insoluble tannate of quinina is soon separated. I have reason to believe that the precipitate which falls when the decoction of bark is allowed to cool, consists chiefly of tannate of quinina.

* *Dublin Medical Press, July*, 1841.

CASE OF COLICA PICTONUM, WITH BLUE DISCOLORATION OF THE GUMS.†

BY HENRY JOHNSON, M.D., SHREWSBURY.

Jan. 7, 1841.—I was desired to see William Benson, aged forty-nine, a plumber. He complained of constant aching pain at the epigastrium, which was very much aggravated at intervals. He had also pain in the knees,

† *Prov. Med. and Surg. Jour.*, 31st July, 1841, and *London and Edinburgh Journal of Medical Science*, Nov. 1841.

ankles, arms, and in the tendon of the pectoralis muscle. These pains were not increased by pressure or motion. The tongue was white and moist. Pulse soft, not quick. The bowels were confined, and the appetite was generally craving.

He stated, that about a fortnight ago he was in his usual state of health, and was at work in Wales laying down some lead pipes, in which occupation he was much exposed to cold, and thinks his present illness, which has only lasted about a week, was brought on by that exposure. His bowels are habitually inactive, three or four days passing without a motion. Has been a plumber several years. On looking into his mouth, I discovered the peculiar blue line on the gums, as described by Dr. H. Burton in the *Medico-Chirurgical Transactions*. See also *The London and Edinburgh Journal of Medical Science*, No. II. (Feb.) p. 128. The edge of the gum, where it is attached to the neck of the teeth, was fringed with a very distinct blue line, about one-twentieth of an inch in width, so that three or four of the molar teeth on each side in the upper jaw were thus half surrounded towards the roof of the mouth with a blue crescent.

Active purgatives were administered.

8*th*. All the pains better; almost none in the lower extremities; has had no sleep; epigastrium slightly tender; pulse 96, soft; thirst and retching; bowels freely moved; stools dark and scybalous. Repeat the purgatives.

9*th*. Has had some sleep; four stools; no scybalæ in the last, but dark and bilious; pains much abated; pulse 84; urine high-coloured and turbid; tongue very white and moist; some appetite.

R. Calomel, two grains.
Opium, one grain,
Antimonial powder, three grains.
A powder to be taken every sixth hour.

11*th*. Hardly any pain in the stomach; bowels regular; appetite improved, and sleep returning.

17*th*. Quite well. The blue line still visible, but more faint.

Remarks.—This is the only instance in which I have observed the phenomenon pointed out by Dr. Burton. He, however, has seen it in many cases, and suggests its presence as a valuable diagnostic sign in derangements of health, caused by the accidental introduction of lead into the system. Dr. Burton makes no attempt to explain how the coloured line here spoken of is produced. The following explanation has occurred to myself.—

It appears that lead, when taken into the system, has a peculiar tendency to affect the salivary organs, producing an increased flow of saliva. From this and other facts, it is probable that it enters the mass of the blood, and circulates therewith over the whole body. The salivary glands are stimulated to increased action by its presence, whilst another operation goes on in the gums. From the decomposition of particles of food, the decay of teeth, or the putrefaction of the tartar, it is probable that the mouth of almost every one contains at times a small portion of sulphuretted hydrogen. Even among those who clean their teeth, and therefore do what they can to remove the above sources of this gas, I have repeatedly found that a slip of paper impregnated with a solution of lead, in a few minutes gave a trace of this gas, by becoming slightly discoloured.

Now, it is easy to understand how the sulphuretted hydrogen, acting upon the lead within the vessels of the gums, precipitates the sulphuret of lead, which, remaining in the substance of the mucous membrane, imparts to them the peculiar blue tinge above-described; and this occurs only at the dental margin of the gums, partly, perhaps, on account of the thinness of the membrane at this point, and also on account of its proximity to the tartar of the teeth, one great source of the sulphuretted hydrogen.

PREPARATIONS OF UNGUENTUM HYDRARGYRI NITRATIS, AND OF SEDATIVE SOLUTION OF OPIUM.

To the Editors of The Chemist.

Southampton, Nov. 6, 1841.

Gentlemen:—

Through the medium of 'The Chemist,' allow me to introduce a new formula for preparing the Unguentum Hydrargyri Nitratis—not that I consider my process superior to that recommended by Mr. J. Harvey in your 18th No., but finding it objectionable on account of not being able at all times to procure the cocoa-nut oil, and that sometimes not genuine, which happened with me a short time since, and which led me to invent another process that may be found useful to some of your readers who value superior preparations:—

Take purified mercury .....1 oz.
nitric acid .....11 drachms.
spermaceti and white wax ā ā 3 drachms.
olive oil .....9¼ oz.

First dissolve the mercury in the acid, then melt the wax and spermaceti in a pipkin, stir in two ounces of the oil, and keep it over the fire until it becomes clear. The remainder of the oil being poured into a mortar and rubbed together for a minute with the solution of mercury, quickly pour in the spermaceti and wax, keeping the whole briskly triturated with the pestle until it is cold.

The strength of the ointment prepared as above will be found exactly the same as that

ordered in the Pharmacopœia, retaining the same color and keeping one uniform consistence.

If not occupying too much space, I think the following will be found one of the best forms for preparing a sedative solution of opium: every process that has been given in various publications appears to me to have been nothing more than solutions of opium in acetic or citric acids, and consequently containing all the exciting principles of opium.

Take opium sliced three ounces, distilled water eight ounces, boil for a quarter of an hour in a covered vessel, and filter; repeat the process three times, by pouring fresh portions of water on the dregs, mix the filtered solutions, and evaporate to one pint; when cold add a solution of sesquicarbonate of ammonia till precipitation ceases, filter immediately (before the morphine crystallises), wash the precipitate with distilled water, mix it with the filtered liquids, and evaporate carefully to an extract; dissolve the extract in fourteen ounces of distilled water previously acidulated with one drachm of citric acid; lastly, filter and add two ounces of rectified spirit. After the solution has been made for a few weeks, a portion of coloring matter will deposit, which must be separated by filtration.

Tests.—Solution of sesquicarbonate of ammonia will produce no precipitation, if carefully prepared—nitric acid strikes an orange-red color.

The strength of this sedative solution is about double that of laudanum, but it can be prepared in a more concentrated state, by increasing the quantity of opium and citric acid to the same portion of the solvent of the extract.

Trusting that the foregoing will be found useful,

I remain, Gentlemen,
Your obedient Servant,
Henry Osborn.

ON THE PREPARATION OF VINUM FERRI.*

BY M. DONOVAN, ESQ.

The virtues of this preparation, the first metallic medicine on record, have been known to mankind since the time of the Argonautic expedition; its medicinal character has therefore stood the test of experience during 3100 years,—and it is now more in use than it has been for a long period. The will of the profession retains it, although it is expunged from the three British Pharmacopœias; and a medicine that hath withstood such vicissitudes cannot be destitute of virtue. Why, then, is it expunged? why is there so much difference of opinion? The answer is, because there are such differences in its strength, and in the modes of preparation.

I have, by a very simple process, removed all uncertainty from this preparation, and now obtain it always of the same strength, containing an effective quantity of iron, of an agreeable flavour, and still possessing all the aroma of the wine. The process is:—Take of the best hock one pint; common rust of iron of the shops, well levigated, two ounces. Introduce both into a matrass, which plunge into a water-bath maintained at the temperature of 100°. Constantly agitate the matrass for an hour; then remove it from the water, and the next day filter. The colour of this vinum ferri is a very deep greenish brown, almost black when the volume is great; its taste is ferruginous, agreeably and highly vinous; it produces a pleasant warmth in the stomach, and never sickens. In its effects it must be tonic, diuretic, emmenagogue, anthelmintic, and carminative. It does not, in a moderate dose, excite. No other wine than hock will afford a preparation possessing these virtues. The dose for an adult may be three or four drachms thrice a-day; in smaller doses it is of little use. If it is to be exhibited in combination with a bitter, it agrees well with colombo or gentian. By this method, in one day, we obtain a far better preparation than is procurable by the processes of the pharmacopœias in two months. The iron exists in it chiefly in the state of protoxide.

* *Dublin Medical Press, June* 23, 1841.

ON THE PREPARATION OF MEDICINAL WATERS WITH MAGNESIA.

(FROM A CORRESPONDENT.)

As few chemists, and still fewer apothecaries possess stills, the medicinal waters, such as aqua menthæ, anethi, &c., are in general prepared by triturating the essential oil with magnesiæ carbonas, adding rain-water and then filtering, which method is, I believe, recommended by several writers on pharmacy.

Having had constant experience in dispensing, I have frequently observed the inferiority of waters so prepared to those distilled; they are always weaker, and they soon spoil; but having lately made an observation which leads me still more strongly to object to such waters I am induced to lay it before your readers.

Having occasion to dissolve 3fs ferri iod. in ℥xij aquæ cinnamon. I perceived an immediate decomposition, and from the rich color recognised ferri sesquioxydum: on enquiring, I found that the water was prepared with magnesia, and I therefore concluded that the small quantity of magnesia in solution having passed through the filter, decomposed the ioduret of iron, forming ioduret of magnesia, and precipitated the ferri sesquioxydum, formerly called subcarbonate of iron.

Under these circumstances, I should recommend, where distilled waters cannot be procured, that a sufficient quantity of essential oil dissolved in spirit he added to previously filtered rain-water, which will not decompose those delicate chemical combinations, the use of which daily increases.

J. S.

Peterborough.

ON DIACETATE OF LEAD IN INTERNAL HEMORRHAGE.*

BY W. SWEETING, ESQ., ABBOTSBURY.

The use of this remedy has been long known, but as far as my observations extend, it has been administered in inefficient doses, and with combinations which appear to me objectionable, and made upon wrong principles.

Four or five years have elapsed since I first administered this medicine, in what I consider an effective dose. My practice is to give it in five-grain doses, every two, three, or four hours, according to the exigency of the case. The last case in which I employed the diacetate, was one of uterine hemorrhage, consequent upon abortion. The woman had miscarried the day before I saw her; she had lost a large quantity of blood, and the hemorrhage was still going on; she was pale, restless, sick, and the pulse scarcely perceptible at the wrist.

I immediately gave her five grains of the diacetate dissolved in distilled water, and repeated it every hour for twelve consecutive hours, and, upon an abatement of the hemorrhage, continued it every four hours for the next twenty-four. The woman recovered.

The diacetate should be rubbed up with a few drops of concentrated pyroligneous acid, in order to insure a complete solution of any carburate of lead, distilled water added, and the whole filtered through paper: with these precautions no ill effects need be feared.

A young gentleman labouring under typhus fever was attacked with diarrhœa, and discharge of blood from the bowels; the diacetate in the full dose was administered, and both hemorrhage and diarrhœa restrained after two doses. He recovered.

About two years since, I was called to a man in this village, labouring under a clearly-marked case of Asiatic cholera. He had been attacked at seven in the morning, but I was not sent for till noon, when I found him pale, pulseless, cold, and all but in that frightful state of collapse denominated the blue stage. I gave him five grains of the diacetate immediately; the draught was at once rejected. I then administered one grain every ten minutes, in a teaspoonful of acidulated water. After he had taken the medicine for the space of two hours, the spasms wholly left him, with every symptom of immediate danger, and the man speedily recovered.

Dr. Graves of Duhlin has recommended the diacetate in cholera, in combination with opium, and at longer intervals than I employed it. It will be a satisfaction to me, that others whose situations furnish opportunities of making more extensive inquiries into the use of the diacetate, follow up the practice herein recommended.

* *Prov. Med. and Surg. Jour.*, 14th Aug. 1841.

REMEDIES AGAINST RELAPSE IN INTERMITTENT FEVER.†

In a case of intermittent fever, which yielded readily enough to the usual remedies, but always returned when these were given up, Dr. Kuntzmann of Berlin saw the disease effectually subdued by the exhibition of a table-spoonful of the powdered stem of the pumpkin, in half a table-spoonful of a tincture of wormwood. This dose was given every day at the same hour, and when indications of an approaching paroxysm were experienced. Dr. Osann says, that relapses of intermittent fever are best prevented by the use of the Tinct. Absinthii, which he has long been in the habit of prescribing, along with an equal quantity of the Tinct. Cinchon. Compos.

OFFICINAL IODIDE OF POTASSIUM.‡

As met with in the shops this salt is seldom pure; it mostly contains an admixture of iodate of potash. A solution of such a salt deposits a precipitate of iodine on the addition of nitric acid. Frequently it contains a large quantity of carbonate of potash. Perhaps the best mode of preparing iodide of potassium, is by the addition of carbonate of potash to a solution of iodide of iron at the boiling point, seizing the precise point of saturation nicely, and then evaporating.

PRESERVATION OF MEAT.

The new process for preserving meat by injecting salt into it by means of powerful pneumatic pressure, will shortly be put into operation at Buenos Ayres and other parts of South America, where it is well known that cattle

† *Hufeland's Journal, June*, 1841.

‡ *Wöhler, in Annalen der Chemie und Pharmacie, Juli*, 1841, and *London and Edinburgh Journal of Medical Science.*

are extensively slaughtered for the exportation of their hides, the carcasses being completely valueless. The meat thus prepared, will form an original article of export to this and other countries, and, should the speculation succeed, our provision market may be supplied with a new description of animal food, at a very cheap rate. So extensive are the herds of cattle and sheep, in the immense productive regions of the Pampas, that a traveller in South America a few years since, states, that the carcasses of sheep were used as fuel in heating furnaces.

EFFECT OF GAS LIGHT UPON THE HEALTH.

To the justice of the following remarks, which we take from a late lecture delivered by Dr. Epps, at the Mechanics' Institution, at Liverpool, there are few who will not be disposed to subscribe.—"And here let me notice one circumstance, in connexion with ventilation. It is this — *the immense consumption of pure air by the combustion of gas.* The quantity consumed by a single burner, is considerable; and when there are numerous burners, the consequent deterioration of the atmosphere must be very great. It may, therefore, be presumed, that those who are confined in establishments in which many gas-lamps are, hour after hour kept lighted, *must*, especially if free ventilation is not established, breathe a poisonous atmosphere, and thus have their bodily health injured. This is particularly the case in shops or warehouses, where *goods* abound: the impurities of the air are *absorbed by the goods*, and thus a new source of poison is created, operating upon the health, even when the gas burners are not lighted. There are evils connected with gas, which *indirectly* add to this deterioration: the cheapness of the light, the little trouble connected with it, the ease with which it is put on and put off, create a strong temptation to the trader to adopt late hours, which, by exhausting the constitution, render the persons exposed to the noxious air still more liable to the injuriousness of its influence. In fact, all *artificial light* is injurious, more or less. It is injurious, because the progress of combustion is itself a *deteriorator of the atmosphere;* and, therefore, day-light should be the time in which business should be, if possible, completed.

DEFICIENCIES IN DRACHM AND GRAIN WEIGHTS.

To the Editors of The Chemist.

GENTLEMEN:—

My attention has recently been called to the great inaccuracy which exists in many of the drachm and grain weights in general use. I have obtained sets from different houses, and in all, great discrepancies have been found. In one ½ drm. weight, as much as 6 *grains* was deficient, and proportionally great inaccuracies were observable in the grain weights. This certainly is a serious evil, and dispensing chemists should be cautioned in this respect. I should like to know where such as may be relied on are to be had.

I am, Gentlemen,
Your obedient Servant,
J. Y. B.

ON THE MILK SOLD IN PARIS.*

BY M. QUEVENNE.

THE bad quality of the milk sold in many dairies in Paris, is a fact which all the inhabitants of that capital are fully aware of. M. Quevenne, apothecary to La Charité, who has endeavoured to find out the cause of it, is of opinion, that it is owing rather to the mixture with other substances to which it is subjected in the hands of the milk-sellers, than to the food with which the cows are fed, or the byres in which they are lodged. The cows of Paris and its neighbourhood, on an average, give eleven litres of milk, daily, during the year. From each litre, thirty-four grammes of butter can generally be obtained, while from the milk of other countries, twenty-nine grammes of butter can only be procured. Thus the milk of Paris and its neighbourhood is richer in butter by one-eighth. The milk of Paris considered as aliment, is good and wholesome, but the confinement of the cows in their dark abodes, deprives it of that aromatic and savory taste possessed by the milk of those cows which feed in the open air; however, as long as it is pure and fresh, it forms an aliment of good quality. The influence exercised by the food of the cows over the milk, is confined entirely to the taste and to a slight change of colour. When they are fed upon peas and beans, it acquires the insipid and herbaceous odour of these vegetables and it coagulates more rapidly when the food is malt. In a word, the milk is so much the more agreeable to the taste, as the cows are fed in winter on beet-root, straw, hay, lazun datches and bran, which they always get in more or less quantity.

M. Quevenne having purchased numerous specimens of milk at different prices, and in different parts of Paris, has ascertained that the only difference the price makes in the milk, is to deprive it of cream, and dilute it with more or less water. However, at certain periods of the year, viz., during thunder storms and great heat, some milk-sellers, especially those at a little distance from Paris,

* *Annales d'Hygiéne et de Méd. Legale*, July 1841; *and London and Edinburgh Monthly Journal of Medical Science.*

add to each litre about two grammes and a half of the carbonate of soda. This salt has the power of neutralising for some time the acid properties of the milk, which cause it to coagulate. But this mixture does not falsify what we have already said, as it has no bad effect upon the health. Nothing else is ever added to the milk of Paris, but what we have just mentioned. There is no truth in the belief that adulterations are made with eggs, gum, sugar, flour, potatoes, or decoctions of bran, rice, or barley, as these substances for the most part, are all too expensive. The general price of milk is four sous the litre. Good milk cannot be had under six or eight, and the pure milk not deprived of its cream, sells at from ten to twelve sous the litre.

ON THE REMEDIAL MEASURES TO BE ADOPTED IN CASES OF ASPHYXIA FROM THE VAPOR OF CHARCOAL.*

BY GABRIEL PELLETAN.

HAVING had occasion to attend several persons attacked with asphyxia from the vapor of charcoal, I have proved that the most simple excitant is the passage into the nasal fossæ of a feather dipped in common vinegar.

It is the means which has always first caused the muscular contractions indicating revival.

DISCUSSION ON ARSENIC, IN THE ACADEMY OF MEDICINE.†

Paris, 15th August, 1841.

I REGRET exceedingly to begin this correspondence, intended to establish a closer and more prompt correspondence between the cultivators of medical science in this country, and in Great Britain;—it pains me, I say, to begin this correspondence with the arsenic question, which has now, for nearly two months, been discussed in the Academy of Medicine, with an acrimony, a rudeness of expression, and an intensity of personality, well calculated to grieve every impartial and right-feeling man. Your readers are, I presume, aware of the origin of this discussion. They know that Marsh's apparatus, and its use in investigating supposed cases of poisoning with arsenic, is ostensibly the subject of dispute; but they may perhaps not be aware of the secret origin which certain individuals have had chiefly in view, viz., to throw discredit on M. Orfila, as an authority in forensic medicine, and to lower him in the estimation of his professional brethren.

The point at which M. Orfila's researches may be said to begin, is the fact that arsenic absorbed by the organs, may be discovered by destroying the animal matter constituting these organs. When animal matter is destroyed by the action of nitric acid, or nitrate of potassa, the residue is placed in Marsh's apparatus, and arsenical stains collected on a porcelain capsule by the burning of arseniuretted hydrogen. This process, when announced, was speedily repeated by different experimenters. MM. Flandin and Danger, obtained spots which they said were identical with true arsenical stains, although not an atom of arsenic had been put in their apparatus. Moreover, they maintained that the carbonization of animal matter in close vessels, by the aid of sulphuric acid, was a process preferable to its carbonization by nitric acid, or nitrate of potash in open vessels. Though the Institute, and the Academy of Medicine are not agreed on this last point, they have satisfactorily settled the question as to the alleged identity of the true and false arsenical stains. The former are instantly dissolved by nitric acid, without the aid of heat. When the liquor is evaporated, and the residue treated with perfect neutral nitrate of silver, it gives a brick-red arseniate of silver; whereas, the false are sparingly dissolved by the same means, and the product, with the nitrate of silver, is a yellow deposit of phosphate of silver. For these reasons, that modification of Marsh's apparatus should be used, which has been made by the Institute. It consists of a flask with a curved tube, containing amianthus, which prevents the too violent effervescence of the liquid. At another part of this same tube, the arseniuretted hydrogen gas is decomposed by the aid of a spirit lamp, and a metallic ring obtained. The chemical reactions of arsenic ought to be verified on these rings as on the spots. By following this plan, mistakes are impossible.

To whom are we indebted for these discoveries, and to whom do we owe these valuable precepts? Is it to M. Orfila, or to his antagonists, MM. Flandin and Danger? It stands recorded in the Reports of the Academy, that long before these gentlemen had announced the possibility of having pseudo-arsenical stains, M. Orfila had stated the method of testing, to avoid fallacy from this source. So far back as 1839, he insisted upon the necessity of collecting the arsenic both on the capsules and in the tube. Justice to M. Orfila demands this statement, while, at the same time, it must be admitted that others deserve credit for perfecting the method of carbonizing the animal matters, and of fixing more attention on the pseudo-arsenical spots.

MM. Flandin and Danger deserve this meed of praise; and to them we are also

* *Journal de Chimie Medicale*, Aug. 1841.

† From the Paris correspondent of *The London and Edinburgh Journal of Medical Science*. No. ix, Sept. 1841.

indebted for the proof of the non-existence of arsenic normally in the bones. The establishing of this single point is sufficient to make their researches illustrious; but their friends in the Academy of Medicine have been ambitious to gain more glory for them. During five sederunts, with M. Gurdy at their head, they have fought with rage and bitterness to pervert the true meaning of the labours of M. Orfila, and to wound him by introducing into the debate useless and unmannerly personalities; and to a certain extent they have accomplished their unworthy object. The Academy, wearied, but not convinced, has fallen into the snare, and consented to modify the conclusions of the commissions. Still, however, these remain substantially the same, and the Academy, like the Institute, has rendered homage to the scientific labours of M. Orfila. The following are the conclusions which this learned body has at last adopted.

1. It sometimes happens, that from incomplete incineration or carbonization, non-arsenical stains are formed by Marsh's apparatus, which have the appearance of true. 2. It is impossible to mistake the pseudo-arsenical for the arsenical stains, if they are subjected to the action of chemical re-agents. 3. The processes for carbonization by sulphuric acid, and nitrate of potash are equally good; but sulphuric acid is the preferable substance to employ, when one wishes entirely to destroy fatty matters.

The apparatus of MM. Danger and Flandin is ingenious; but it is better to employ that of M. Orfila, which is substantially the same as that adopted by the Institute.

These conclusions were put to the vote, and carried amid much tumult and uproar. After the meeting broke up, groups in keen altercation were to be seen within the hall, and without in the quadrangle.

CASES OF SUFFOCATION AND POISONING.*

BY J. B. THOMSON, ESQ.

CASE I.—SUFFOCATION FROM A PEA IN THE WINDPIPE.

August 8th.—This evening I was summoned, without delay, to visit a fine child, of two years and a half of age, apparently dying of suffocation: the eyes were fixed and staring; the countenance livid, and expressive of great anxiety; the inspirations difficult and noisy; the expirations short and forcible. The child occasionally attempted to cry and cough ineffectually, or with a hoarse croupy sound. There was a sound in the windpipe like that of a valve opening and shutting, which sound seemed to arise from a foreign body striking at intervals against the region of the rima glottidis. Slight convulsive motions affected the whole body. On looking into the throat I saw a number of peas lying at the back of the fauces, and pushed them into the gullet; still the alarming symptoms remained, and it seemed evident that a pea or some foreign substance had found its way into the larynx, or was probably entangled in the chink of the glottis. I ran home for a scalpel, and when I returned the child seemed in *articulo mortis*, so that the friends thought it needless to do any thing. I proceeded, however, to open the trachea, and the moment the scalpel entered, the child was relieved. In a few seconds expiration and inspiration went on freely. Considerable venous hæmorrhage took place. Still there was no appearance of a foreign body. I introduced a bent probe through the external opening upwards to the glottis, and felt a hard round substance, which I tried to push upwards into the throat. Convulsive coughing took place, and, on withdrawing the probe, breathing went on by the mouth and nose, and every symptom of danger disappeared. Soon after this a neighbouring medical practitioner whom I had sent for arrived, and in a consultation with him it was resolved that, although there was no certainty of the foreign body being removed, yet all symptoms of danger were absent, and no further operation was warranted. Leeches and antimonials were had recourse to, and any inflammatory results were slight and easily obviated. The child got well; the wound healed; and my patient even ran about the house and out of doors with his wonted liveliness. The only suspicious symptom remaining was cough for about a fortnight after the accident. I had ceased attendance, and my fears were beginning to be forgotten, when on the 26th of August, eighteen days after the first alarm, I was asked to visit the child. He was feverish, had a bad cough, with mucous râle; appetite impaired; flesh soft and flabby. The mucous râle and painful cough increased my suspicions that a foreign body was still lurking about the bronchi. The child had antimonials and a purgative.

Next morning an express called me to see the child. I found all the former alarming symptoms of suffocation had suddenly returned, and the mischievous body was evidently floating loosely in the trachea, and striking, at every cough, against the rima. Although the child's pulse was low, and there was not the same hope of the operation being ultimately favourable, I insisted on again opening the trachea. The friends refused to submit, on the ground that the child was just dying, and there was no room for hope. Convulsions carried off the child within two hours from

* From *The Medical Gazette* of Oct. 22, 1841.

this attack. No post-mortem inspection could be procured.

Remarks.—It appears quite certain, from the history of this case, that a foreign substance (probably a hard pea) had found a lodgement about the upper part of the windpipe, threatening suffocation; and on the trachea being opened, the admittance of air through the opening revived the sufferer. At the same time the pea left the upper part of the windpipe, and occupied a situation in the bronchi, which had no perceptible influence upon the respiratory process. It is well known that a foreign body may so remain for a long time in some part of the breathing apparatus, and be coughed up through the rima months afterwards; but my case shows that a very different result may take place—all may seem favourable, and sudden suffocation ensue. I own I have had some *compunctious visitings* since this case terminated fatally, and deeply regret that I did not insist strenuously upon keeping the opening in the trachea patent by the introduction of a tube; and were such a case again presenting itself, I should certainly try to benefit by my melancholy experience in the present instance.

CASE II.—POISONING BY SULPHURIC ACID.

On June 6th, at 11 o'clock P.M., I was called in great haste to visit an infant of about a year old. The mother had thought it necessary to give her child a little castor oil for a slight cold it had caught. The castor oil stood in a closet beside the concentrated sulphuric acid, and both articles were contained in the clear bottles commonly used for Ol. Ricini. A tea-spoonful of the castor oil was first given in a little milk with sugar; and part of this mixture being lost in the administration, it was resolved to give a little more. Half a tea-spoonful of sulphuric acid was then given by mistake instead of the castor oil. This latter dose was poured into a tea-spoon containing a little sugar and milk, with some remains of the first dose adhering to the spoon, and in this way administered to the infant. The mistake was immediately discovered from the little victim's painful cries and restlessness, and confirmed by coloured figures in the nurse's gown being discharged by some of the liquid being rejected. Not more than twenty-five minutes elapsed before I saw the child, which was two miles distant from my house. I found the little sufferer crying incessantly with a rough croupy voice. It was restless, agonized with pain, and had occasional vomiting of a tough glairy mucus. The messenger who was dispatched for me having mentioned what had occurred, I had provided myself with magnesia, which was instantly, along with milk, poured into the child in large quantities. Castor oil was also administered freely. The pulse was rising rapidly, and was very small and thready. In order to anticipate the worst, leeches and a blister to the throat were applied without delay, but without any obvious relief. Demulcents of a mucilaginous kind were occasionally given and swallowed. When I left the house of my patient, at 2 A.M., the child seemed to sleep, but there was increased roughness in the respiration; mucous râle; pulse rapid and small; bowels freely opened.

Next morning, at 9 A.M.—All the symptoms aggravated; heavy respiration; mucous râle; pulse 140, and thready. A consultation was now proposed by myself with my able and experienced friend, Mr. Syme, of Alloa. We saw the child together about noon, and pronounced the case hopeless. No change in the treatment was deemed necessary. In the afternoon, about 4 P.M. patches of disorganized membrane were coughed up by the child. It died about 11 o'clock P.M., exactly twenty-four hours after the sulphuric acid was administered.

No necrotomic inspection was allowed.

OINTMENT FOR THE ITCH.*

BY DR. DE LA HARPE.

The following is the composition of the ointment employed and recommended by Dr. De La Harpe:—

Flowers of Sulphur.....	16 parts.
Sulphate of Zinc.....	2 ,,
Powder of White Hellebore ..	4 ,,
Soft Soap	31 ,,
Lard	62 ,,

He used it in upwards of 400 cases. The mean duration of treatment was, in 1836, eighteen days; in 1837, fifteen; in 1838, eleven; and in 1839, ten.

POISONING BY TOBACCO GIVEN IN ENEMA.—MISTAKE OF THE APOTHECARY ATTRIBUTED TO THE FRENCH DECIMAL SYSTEM OF WEIGHTS AND MEASURES.†

BY M. TAVIGNAT.

M. Tavignat, an *interne* of hospitals, has recently published in the *Gazette Médicale*, a case which in more respects than one is full of interest. A man of fifty-five years of age, of strong constitution, entered the hospital to be treated for enlarged prostrate. On examining him with attention, small worms were found to exist in the rectum. To destroy them, a tobacco enema was prescribed. From excess of precaution, the dose ordered in the visit-book was only sixty centigrammes in two hundred grammes of water. The prescription

* *Gazette Méd. de Paris*, July 1840.

† *Journal de Médecine et de Chirurgie Pratiques, January* 1841, *and London and Edinburgh Monthly Journal of Medical Science.*

was in all respects correctly made out, but in place of sixty centigrammes, sixty grammes were given. Seven or eight minutes had hardly elapsed after the administration of the clyster, when symptoms of poisoning manifested themselves, whereupon M. Tavignat, the *interne de garde*, was immediately sent for. He immediately ordered a purgative enema, and a stimulant potion. Sinapisms were applied to the extremities, and cold applications to the head. The patient was also bled from the arm, and the whole body subjected to frictions. He did not rally, however, but remaining in a state of profound stupor, was seized with general trembling. The respiration became more and more anxious, and he died comatose without having vomited.

Remarks.—We have said that the case of Tavignat is interesting for more reasons than one, but for the present we will only advert to one of its practical applications. It discloses a lamentable error committed in a Parisian hospital, where it is well known that the system by which drugs are dispensed, is well organized. Are we to attribute this blunder to the ignorance of the apothecary whose duty it was to make up the prescription? Assuredly not, for the most ignorant pupil is familiar with the decimal divisions, and knows thoroughly the value of the gramme and the centigramme, but as we have stated on a former occasion, it is to the decimal system itself that we must attribute the fatal mistake. Constant attention is ever requisite not to confound the gramme with its compounds; for the words decagrammes, decigrammes, centigrammes, constantly in turn present themselves to the pen of the prescriber, and the mind of the apothecary. Such blunders as that now narrated, be it remarked, do not occur in quarters where the advocates of the new system can allege the existence of ignorance. To-day the accident takes place in the pharmacy of a Parisian hospital, and some time ago the journals recorded that a professor of a private school of medicine was the cause of a similar misfortune.

ADULTERATION OF BREAD.

To the Editors of the Chemist.

Gentlemen:—

As you have repeatedly exposed in the pages of *The Chemist*, the fraudulent adulterations which are practised in articles of food, as well as in drugs, I expected to have found in your last number some notice of the convictions which have lately taken place in Staffordshire and Cheshire, for mixing gypsum with flour. This shameful sophistication of the prime necessary of life, has been carried on by a few parties on a large scale, and would, no doubt, have become more general, but for the prompt and vigorous measures adopted by the local authorities for its detection and suppression. As it is not improbable that similar adulterations are or may be practised in other quarters, where attention has not been awakened to the subject, it is very desirable to keep it before the eyes of the public; and I am sure that your pages will be cheerfully devoted to this object.

I have myself examined bread which contained about sixteen per cent. of gypsum; and a sample of flour which contained eight per cent. of the same adulteration!

The most effectual mode of putting a stop to these iniquitous proceedings is to arouse the vigilance of the public, and to furnish them with a simple method of detecting the fraud. The usual plan, and that which I have employed is, to incinerate suspected flour or bread in an open shallow vessel, keeping it at a red-heat, till the carbon is entirely burned away. The residue (with the exception of the very minute quantity of ashes left by genuine flour, and the salt used in making bread) may be considered as adulteration, and its nature determined by the usual tests. If the calcination be conducted in a covered crucible, the sulphate is converted into a sulphuret, and a solution of which throws down a dark precipitate from a solution of acetate of lead.

The process by incineration is a tedious one; but perhaps the best that has yet been proposed. By suggesting a more simple and ready test, adapted for general use, you would confer a benefit on the community.

I am, Gentlemen,
Your obedient Servant,
Q.

ON THE VALUE OF THE MICROSCOPIC EXAMINATION OF MILK IN THE CHOICE OF NURSES.*

BY M. DEVERGIE.

The author gives the results of several hundred observations which he had opportunities of making at the Nurses' Office (*bureau des nourrices*). He examined the milk of nurses with the microscope, like M. Donné, and he arrived at the following conclusions:—

The nutritive quality of milk is in direct relation with the quantity and quality of the globules. Under this point of view, the milk examined by M. Devergie presented three varieties, or rather three degrees. The milk with large globules was ordinarily met with in women of a sanguino-nervous constitution; however, it was sometimes also found in lean women; so that the best milk, that is to say, the most nourishing, is not always in direct relation with the constitution of the mother;

* *Royal Academy of Medicine, Paris*, Sitting of September 28, 1841. From the *Journal de Chimie Medicale*, November, 1841.

hence is explained the fact that thin, lean women may be excellent nurses. However. when milk is in large globules in one woman, and in small globules in another, it may be concluded that the former is a better nurse than the latter, for the goodness of the nurse should be reckoned by the degree of assimilation of which her milk is susceptible in the infant.

Now, it cannot be said *à priori*, that an infant is better nourished, and thrives more, with milk containing small globules, than with that containing large ones. It is therefore for experimental observations to decide whether the milk of such and such a nurse is good or bad for the infant; but when observation shall have taught, by example, that the milk does not nourish the infant, supposing that there is no apparent disease which may account for anhæmia (*anhémie*), micrography may then be resorted to, to prove the quality of the milk. If the latter, for example, were milk with small globules, another with large globules should be chosen, and *vice versâ*. M. Devergie has remarked that milk is sometimes of different qualities in each breast of the same woman: but it is more commonly so in those who are in the habit of giving the child one breast more frequently than the other.

Age has no influence on the qualities of the milk, nor has the constitution; observation having shown the author that milk with large globules is met with in women of twenty, as well as in those of thirty-five. Nevertheless, the author is far from giving to these microscopic remarks entire confidence in the selection of a nurse. He thinks, on the contrary, we must keep to the ordinary method and to the data which all accoucheurs are acquainted with; which does not prevent microscopic observation being made at the same time. M. Devergie has also proved several alterations in milk: these alterations relate to the color and the state of the globules. The globules have been found in a state of agglomeration, and the natural color altered to a blue or a green. This latter condition has appeared to accompany certain diseases of the child.

FORMULA FOR BAUDRY's BALSAMIC PECTORAL PASTE.*

R. Gum arabic	3 kilogram.
White sugar	2 ,,
"Thridace" (ext. of lettuce)	8gr.8decig.
Sugar in pieces	31 ,,
Balsam of Tolu	40 ,,
Orange flower water	.186 ,,
Essence of citron	4 drops.
White of four eggs.	

40 grammes of extract of liquorice prepared with stick liquorice, by maceration without heat, and afterwards brought to the proper consistence in a sand-bath.

The matters, being apportioned as above, are prepared as follows:—

The gum arabic is dissolved in double its weight of water, and passed through a sieve: then left to settle for six hours, in order that the smallest portions of sand may be deposited at the bottom of the vessel, then decanted into a well-tinned pan; the sugar, broken in pieces, must now be added, and heated in the sand-bath, stirring continually with a wooden spatula. When the paste is half made, the extract of liquorice and the "*thridace*" are added, and immediately dissolved.

The balsam of tolu is triturated in a mortar, with 31 grammes of sugar in pieces; this powder is put into a small matrass, with the orange flower-water, and the whole is heated in a sand-bath for six hours. At the end of that time, the liquor is filtered and added to the paste.

When, on beating the paste with the back of the hand, it is found to adhere to it but very little, the white of egg is added, in small quantities, stirring all the time, after having been well beaten up, and flavoured with the essence of citron. When all the white of egg is added, the paste is left on the fire for a quarter of an hour, stirring all the while; this paste is then poured into plates or iron moulds, which are exposed to a gentle heat for about a day: they are then removed, left to cool, and the paste is finished.

* *Journal de Chimie Medicale*, August, 1841.

HEMLOCK PLASTER.†

BY M. LEPAGE.

Since the commencement of last summer, I have repeated and compared the different processes which have been proposed for the last twenty years, for the preparation of hemlock plaster; and I must here declare, that none is preferable to that of the Pharmacopœia (French). However, as this process is complained of, and with good reason, on account of its causing a great loss of product, especially when a small quantity of matter is operated on, I propose the adoption of the following process, in which the proportion of hemlock to the mass of other matters is but very little changed from that in the Pharmacopœia:—

White pitch (*poix blanche*)	1 kilogramme.
Resin pitch (*poix resine*)	400 grammes.
Yellow wax	500 ,,
Oil of hemlock	250 ,,
Fresh hemlock leaves reduced to a pulp	2 kilogrammes
Gum ammoniac	500 grammes.

† *Journal de Chimie Medicale*, Oct. 1841.

When all the water of vegetation of the plant is dissipated, submit the matter, while warm, to the action of a strong press, and add the gum ammoniac and the ordinary matter.

The advantages of this pressure are, in my opinion :—

1st. That of giving a plaster not quite so dry as that of the Pharmacopœia, which is rather too much so;

2nd. That of causing less loss of product.

AGGLUTTINATIVE PLASTER.*

BY HERR SCHAEUFFELE.

Herr S. describes a fine sample of agglutinative plaster, a perfect substitute for gummed diachylon, and even superior to it in brilliancy, in suppleness, and in its property of adhering strongly, without producing irritation. He gives the following formula for it :—

R. Resin.....	200	grammes.
Colophane.....	200	,,
Gum ammon.....	10	,,
Gum Galban.....	10	,,
Gum Sagap.....	10	,,
Turpentine.....	60	,,
Simple plaster ..	60	,,
Yellow wax	200	,,

The proportion of turpentine varies according to the season, between 50 and 60 grammes.

The cloth must be of the finest quality; it should be cut in strips of 250 centimetres in length, and 20 or 22 in breadth : it is calendered, each time two strips being placed one on the other. It is on the surfaces which have not received the contact of the cylinder, that the plaster is laid on by means of a knife, in four or six layers, according to the thickness required.

The plaster must be prepared at a gentle heat, giving sufficient time for the gum-resins to dissolve in the turpentine, the colophane and the resin, before adding the simple plaster and the yellow wax.

FORMULA FOR CHOCOLATE OF ICELAND MOSS.†

BY M. TAPIE.

The best means of employing the lichen for combining it with cocoa and sugar, consists in depriving it of its bitterness, at least in some degree, by immersion for a few minutes in boiling water. This done, the water is thrown away, the lichen is left to drain for some hours, then a decoction is made in half an hour : it is strained and evaporated, and the concentration is completed in the sand-bath. When the consistence is nearly like that of an ordinary extract, the matter is poured into plates or capsules, in order to effect a complete desiccation by means of the heat of a stove; this extract is afterwards reduced to a fine powder, which is distributed into the chocolate.

R. Loaf sugar.....	3	kilogr.
Cocoa (caraca in preference)	3	,,
Cinnamon of Ceylon	31	gram.
Extract of dry lichen	403	,,
Jelly of Iceland moss	500	,,

FORMULA FOR THE BALSAMIC PECTORAL PASTE OF REGNAULT.‡

M. Flon, apothecary at Paris, sent to the Royal Academy of Medicine, at its sitting of the 7th of May, the following officinal formula for the above paste :—

Four flowers.....	500	gram.
Gum arabic.....	3000	,,
Tincture of balsam of tolu ..	24	,,
Water	1500	,,

This paste is prepared with the above substances, according to the prescribed rules for the preparation of pastes.

POMMADE OF IODIDE OF SULPHUR.§

This pommade, administered by M. Nanche in phthysis pulmonalis, is prepared according to the following formula :—

Iodide of sulphur	2 decigrammes.
Lard.....	30 grammes.

Incorporate the iodide with the lard.

This pommade is to be rubbed on the legs.

M. Nanche also gives iodide of sulphur internally in the dose of 5 or 6 milligrammes *per diem*.

VERMIFUGE DRAUGHT.§

M. Levacher gives the following formula for the preparation of a draught which he has employed against tænia :—

Castor oil.....	60	grams.
Essence of turpentine.....	16	,,
Distilled mint-water	64	,,
Syrup	32	,,
Powdered gum arabic	8	,,

A mucilage is made in a mortar with the gum, the syrup, the oil, and the essence, afterwards gradually adding the mint-water.

* *Journal de Chimie Medicale*, Nov. 1841.

† *Ibid.* August, 1841.

‡ *Journal de Chimie Medicale*, August, 1841.

§ *Ibid.* November, 1841.

GARGLE OF SULPHATE OF ALUMINA EMPLOYED IN DEAFNESS.*

A young man, aged eighteen, who, for five months, had been troubled with very considerable hardness of hearing, which gave him much uneasiness, consulted Dr. Payan. Blisters on the nape of the neck, and on the arms, and other modes of treatment were ineffectual. The surgeon of the hospital of Aix having examined his throat, found the mucous membrane at the inferior part of the pharynx and the pillars of the velum palati redder and more swollen than in the healthy state; the tonsils were also much larger than they should be: he thought, and with reason, that the Eustachian tube might likewise be swelled and thus obstruct the passage from the pharynx to the ear; he then recommended the use of a gargle prepared with—

Sulphate of alumina . .	4 grammes.
Honey of roses . . .	26 grammes.
Water	225 grammes.

The patient used the gargle four or five times a-day. The guttural phlegmasia was soon modified. At the expiration of a fortnight, 2 grammes of sulphate of alumina were added to the gargle. After six weeks' perseverance in this treatment, the pharyngitis had ceased, the throat had assumed its natural color, and no traces of deafness remained.

BOOKS RECEIVED.

Elements of Chemistry, Including the Most Recent Discoveries and Applications of the Science to Medicine and Pharmacy, and to the Arts. Illustrated by Wood Cuts. By Robert Kane, M.D., M.R.I.A., &c., &c., &c. Dublin: Hodges and Smith. Longman & Co. London; Machlachlan and Stewart, Edinburgh. 1841. pp. 1204.

[This work unfortunately did not reach us until the present No. was made up: it will be reviewed in our next.]

The London and Edinburgh Monthly Journal of Medical Science. Edited by John Rose Cormack, M.D., Edin. London: H. Baillière, 219, Regent Street. Edinburgh: Maclachlan, Stewart, & Co. No. XI. (In Exchange.)

An Investigation of the Proposed Scheme of Medical Reform, in reference to Chemists and Druggists. Comprising an Analysis of Mr. Hawes' late Medical Profession Bill; A Review of the Pharmaceutical Society; and a Defence of the Druggists' "Counter Practice." Addressed to Benjamin Hawes, Esq. M. P., and the Chemists and Druggists of the United Kingdom. By G. Crook, M.P.S. London: R. Hastings, 13, Carey Street, Lincoln's Inn Fields.

[This pamphlet was also too late: we shall notice it fully in our next. In the mean time, we may observe, that it deserves an attentive perusal.]

TO CORRESPONDENTS.

J. T. Leith.—*Bromure* is the French word for Bromide. Bromide of iodine is formed by the direct action of bromine and iodine on each other

Mr. R. H. Kemp, Brighton.—The examination was stated to have been at University College; therefore our correspondent's question was uncalled for.

The suggestion of our correspondent at Hastings shall be borne in mind.

A. J. We do not know.

R. F.—The oxides of gold and silver may be procured at Knight and Son's, Foster-lane, Cheapside: the former is 5*s.* and the latter 3*s.* per bottle.

The China clay may be obtained at the same house.

T. G.—A correspondent and constant reader writes to us—"Anxious to see your useful journal rendered a safe work of reference in matters therein treated, I beg to suggest the occurrence (p. 339) of an error in the assignment of the Rosewood-tree to the genus *Aspalathus*. The best authorities make it belong to the *Jacaranda ovalifolia*."

Communications received from H. E.; A Constant Reader; J.W. B.; R.H.; W.M.; An Apprentice; J.H.; S. B.; A Norfolk Druggist.

Nota Bene.—*All Communications and Books for Review must be addressed, "To the Editors of The Chemist, care of Mr. Hastings, Publisher, 13, Carey-street, Lincoln's Inn Fields, London." Communications must be pre-paid, and sent before the 15th of each month; Books for Review, before the 10th.*

* *Journal de Chimie Medicale*, November, 1841.

The Title, Introduction, and Index for Vol. II. are included in this Number. The Volume may be had of the Publisher, in boards, price 7s.

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